MINING WORLD

MARCH 1958 VOL. 20 NO. 3

Kennecott's Chino Mines Uses Industrial Engineering Page 50

What Does a Swedish Engineer Think of U.S. Mining? Page 54

Loading Tomorrow's Rocket Fuel at U.S. Borax

Page 44

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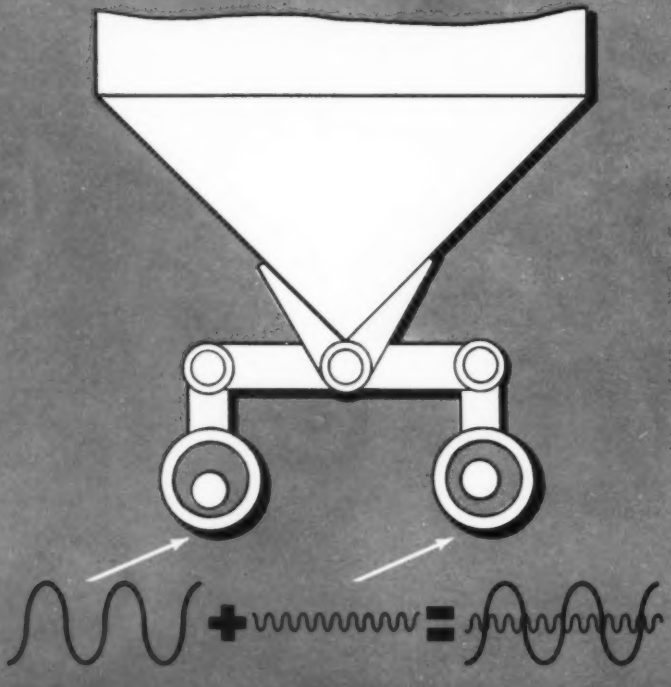

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Right off the Wire

A new system using multiple cathodes is said to double the life of the vapor lamps used on highways.

A thermionic converter has been made that produces electricity directly from heat with an efficiency of eight per cent.

Studies of the northern lights being made with a high-powered, long-range radar may disclose a method of defense against missiles coming over the arctic.

Submarine cable can be made in any length at the Simplex Submarine Cable Division's dockside plant. Single lengths are limited only by the capacity of a cable ship's hold, or the length of a train of gondola cars.

An electronic system of bank record keeping handles random-sized, unpunched paper checks at the rate of 1800 checks per hour to 40,000 accounts.

The world's largest solar furnace is being designed for installation in New Mexico. It will produce temperatures as high as 8,000°F.

Elimination of thermal noise by operating microwave amplifiers at the temperature of liquid helium has been found to greatly increase the range of radar.

An electronic map plotter is expected to make possible more accurate and cheaper maps from aerial photographs and to lend itself to the automation of mapping.

Plans are being made to mount telescopes on balloons in order to make observations above the interference of the earth's atmosphere.

The U. S. Air Force has patented an infrared television camera for use at night or in fog.

A new chemical plant will need no outside source of fuel after operation has begun. All the heat required will come from the process.

It has been found that one area of the human brain contains a record of every detail of the person's experience. Total recall can be produced by the stimulation of a minute electrical pulse.

Phosphors applied to textiles, sheet materials or metal mesh light up when a current is passed through them thus making draperies, for example, sources of illumination.

A new microscope for the study of living tissues uses bursts of ultraviolet light too brief (one thousandth of a second) to injure the tissue. The image appears in color on a television screen.

A new drug promises to save the lives of many persons who might otherwise die from lethal doses of radiation. It has been tried only on laboratory animals.

A form of fiber glass containing uranium 235 has been developed as a fuel for atomic furnaces.

A new amplifier is expected to extend the range of radio telescopes about ten times, enough to equal the best optical instruments.

A giant air mattress, equipped with arresting and launching gear, has been patented for use as a portable airstrip. On it planes could make belly landings without damage.

Tellurium lead cable sheath has excellent vibration, creep and age-hardening resistance, and greater flex life and tensile strength than other lead alloys, say Simplex scientists after exhaustive tests.

A new meter for oil pipelines will measure a flow of 10,000 barrels per hour (four times the capacity of present equipment) with an accuracy of one tenth of one per cent.

Simplex C-L-X (Sealex) metallic sheath is manufactured with thermoplastic covering in colors for voltage or general industrial coding.

A device called an "electronic sentry" guards against fire, abnormal pressure, high or low water levels, temperature changes and other hazards. It calls a designated person by telephone and gives a pre-recorded message.

"Tree" of Knowledge

This strange looking growth tells an important story to the expert eyes of Simplex scientists. It's a Simplex photomicrograph showing "treeing" effect that results when a 15 KV polyethylene-insulated cable is broken down by 100,000 volts. This is typical of the continuing research work done at Simplex.

If you are interested in the important facts that Simplex scientists Kitchin and Pratt have discovered on polyethylene treeing, write for their AIEE Paper No. 58-121.

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Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 20 **MARCH 1958** No. 3

OPERATIONS—TECHNOLOGY

Open Pit Mining

New Borax Pit Swings Into Peak Production 44

BY STANLEY DAYTON

Six months of continuous operation has resulted in development of new drilling and blasting methods at Boron, California pit. Ore is loaded by electric shovels and trucked out of pit with Diesel trucks. Plans call for a belt conveyor in the future.

Refining

New Borax Refinery Makes Wide Variety of Products 48

Chemical refining by dissolution, vacuum crystallization, and drying produces 5 and 10 mol borax. Anhydrous borax is made from granulated product in separate plant.

Management

Kennecott's Chino Mines Division Uses Industrial Engineering .. 50

Industrial engineering at Santa Rita, New Mexico is management's fact-finding and fact-analyzing branch. Engineers study everything from drilling to handling of blister copper to determine better methods that require less time, labor, and money.

Interview

How U. S. Mining Looks To Swedish Engineer 54

Carl-Bertil Berglund, chief research engineer, Luossavaara-Kirunavvaara AB compares Swedish, Canadian, and United States mining equipment and methods.

Convention

Industry Hears New Developments at Colorado Convention 56

A proposal for a new lead-zinc tariff, the announcement of the discovery of a 40,000,000 ton borax deposit in southern California, and the promise for a free market for domestic uranium concentrate highlighted Denver meeting.

Mining World Honors

Industry Leaders Accept Plaques of Achievement 59

In recognition of the advancements in engineering technology and management Mining World awards plaques to P. D. I. Honeyman, Dr. S. W. K. Morgan, Western Nuclear Corporation, American Gilsonite Company, and U. S. Borax and Potash Company.

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ON THE COVER

Open pit mine of the year is featured on the cover. The picture, taken at United States Borax & Chemical Corporation's newly developed mine near Boron, California, shows a Kenworth, model 802 rear dump truck being loaded by a Bucyrus Erie 54-B shovel equipped with an oversize, 3-yard bucket.

MILLER FREEMAN PUBLICATIONS

GRAB SAMPLES From the Mail

What Is Ore?

Dear Sir:

You may remember there was a lot of discussion on the definition of "ore"—almost adnauseam, which was the prime cause of this concoction.

Our geologists of note,
And mining men with conscience,
Are worried by a droll endemic sore;
What's the good of being an expert,
In a very ancient science,
When they really don't know what on earth it's for;
For what is ore?

While assessing—reserves,
And planning—bins and passes
Needs merely application of their skill;
It's really most upsetting,
To the excavating process,
If they don't know what they're sending to the mill.
It could be fill!

Is ore any rock or stone,
That's dug out of the rough,
Irrespective of its showing in the pan?
Or significant assemblages
Of elemental stuff,
Economically interesting to man?
Which assay plan?

Should graphite, shale or muck,
Alright for bricks pass muster?
Be admitted to the M and M in haste?
Or could we keep the membership,
To metal hosts that lustre,
And so retain the sense in noble taste?
Can ore be waste?

Such learned dissertions,
To a common mining guy,
Might be styled politely, wind and puff.
For ore derives from aurum,
In perpetual short supply,

And our job is to get the wretched stuff.
Enough of guff.

A. M. BENSUSAN
Salisbury, Southern Rhodesia

Keenly Interested In Borates

Dear Sir:

I have been keenly interested in borates for the past five years and have studied them in the United States and South America.

Your article on pages 70 and 71 in the October issue of MINING WORLD on borates as chemical fuels is an interesting one.

SIEGFRIED MUESSIG
Geologist
Spokane, Washington

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"T-1" Steel reduces weight of 4-in-1 bucket by 35%, boosts payload by 1,200 pounds

"Our engineers specified USS 'T-1' heat treated alloy steel in the construction of our 4-in-1 skid shovel bucket because we could reduce the original weight by 35%. What's more, we could add one-half yard to the bucket capacity," says Mr. Edward Drott, President and Chief Engineer, Drott Manufacturing Corporation, Wausau, Wisconsin.

The entire Drott bucket is fabricated from USS "T-1"* Steel which has a minimum yield strength of 90,000 psi, nearly 3 times that of structural carbon steel. This strength helped to make the weight reduction possible . . . and the reduced weight on the front end of the tractor improved the balance and increased efficiency.

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Strength after welding. USS "T-1" Steel was found to retain its strength after being welded or flame cut. This was an important factor in design.

Sub-zero toughness. Even at 50° below zero, USS "T-1" Steel retains its high resistance to shocks and jolts in rugged work.

Build better with USS "T-1" Steel. No other steel possesses the remarkable combination of high yield strength, toughness and weldability found in "T-1" Steel. It may be the answer to your problems for many different types of mining and construction equipment. *Remember that we also make* USS COR-TEN*, USS TRI-TEN* *and* USS MAN-TEN* *high strength steels . . . standards for heavy-duty equipment.* United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

An Era Ends

Kennecott Copper Corporation has purchased all of the mining properties of Consolidated Coppermines Corporation in White Pine County, Nevada. Details of this transaction may be found on page 70 of this issue. The mining world is truly sorry to see CCC get out of the mining business in Nevada.

Con Copper, world-famous for development of methods and equipment used in successful block caving of relatively thin, low-grade, unconsolidated, porphyry copper ore at its mines at Kimberly, Nevada, was the latest big copper company to come to major open-pit mining.

Another interesting reason why Coppermines turned to open pit mining is the lack of skilled underground miners and supervisory personnel. This, in itself, is a paradox because CCC was long an industry training ground for these very types of men.

As Con Copper's mining at Kimberly ends, one must remember and pay tribute to those engineers, both living and dead, who did so much to make mining a science—largely underground caving—but open pitting too. Con Copper's men include: Art O'Connor, Paul J. Sharp, William J. Latvala, Ben Webster, Jr., Barney Haffner, E. N. Pennebaker, Tell Ertl, Kenyon Richards, Lester E. Kitch, Paul J. Sirkegain, Cash I. Cook, J. A. Richards, F. J. Bezzic, H. W. Bishop, and W. C. Douglas.

Con Copper still has copper interests in Arizona and other western states. The industry hopes Con Copper will be back mining some day.

What Is Dumping?

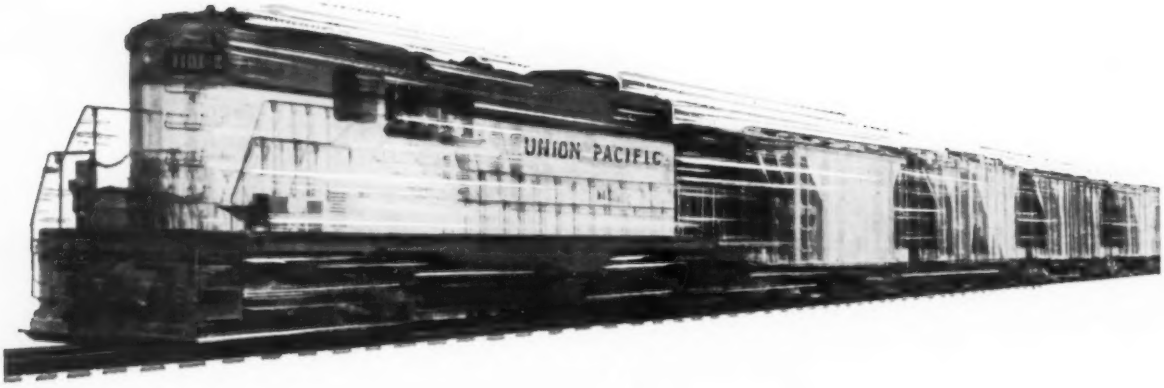
The British Board of Trade, with the backing of Canadian aluminum producers, is considering the placing of anti-dumping duties (tariffs) on imports of Russian unwrought aluminum into the United Kingdom. (The Board of Trade is similar to the United States Tariff Commission.)

Meanwhile, the Canadian government and the greater part of the copper, lead, and zinc mining industries are up in arms about the United States' proposal for increased duties on lead and zinc, and the bills before Congress to change the duty and peril point for copper.

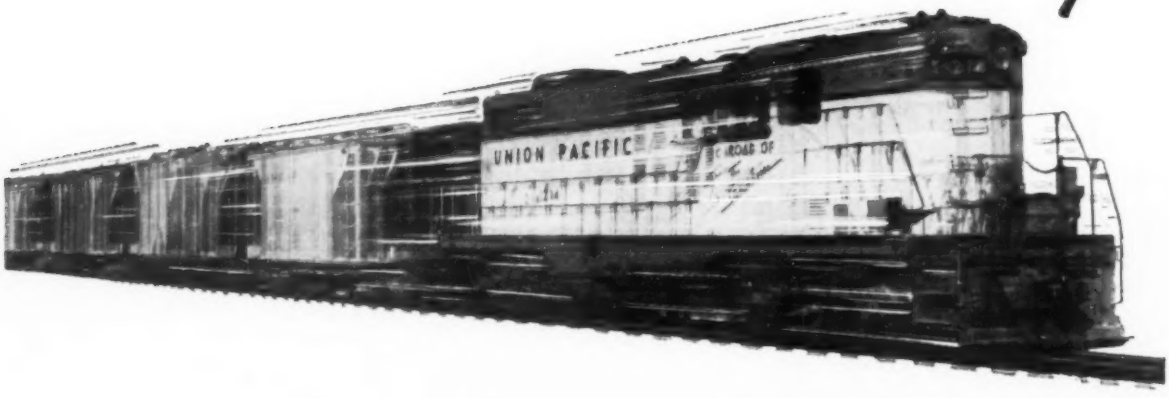
To the shut-down Nevada zinc miner or the fast-losing-money Arizona copper producer imports from Canada are dumping—pure and simple.

To the Canadians and the British, aluminum from Russia is dumping.

There are two things to consider in these actions: first, the paramount desire for any miner to stay in business and the measures he will take to do so; second, the political rather than economic implications of the Russian aluminum. True, Russia is glad to have foreign currency so as to make purchases outside the Soviet Orbit. It is equally true that Russian aluminum's cost, possible use, and demand at home are minor considerations. If production of aluminum, and any metal for that matter, is ahead of the Plan of the moment's needs, then sell it or dump it abroad. Metals can be and are economic weapons to demoralize and shut down industry outside the Orbit.



you say *when and how many*



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Around the clock and around the calendar, some 300 Westvaco Soda Ash covered hopper-cars are in regular customer service. That's by far the largest fleet of modern cars in the industry. It's one more good reason why you'll be happy with Westvaco Soda Ash.

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MINING WORLD NEWSLETTER

Borax . . . Iron . . . Uranium

March 1958

Great mineral potentials still exist for the domestic miner despite the gloom that prevails in many sections of the mining industry.

Western mining remains the backbone of the domestic mining industry.

Opportunities are unlimited as demonstrated by uranium discoveries in the last three years, recent copper finds near Tucson, Arizona, and now borax in California.

The second largest known borax deposit in the world has been found in the Mojave Desert, just 10 miles from U.S. Borax & Chemical Corporation, the number one borax producer. Seventeen drill holes have indicated about 40,000,000 tons on the property of Kern County Land Co. The low-grade ore is about 1,000 feet below surface.

Development of a second Wyoming iron ore deposit is persistently rumored. Planning is in an embryonic stage; start of activity may take two to five years.

The northern Black Hills of South Dakota are being explored by several large companies for adequate reserves of low-grade iron ore suitable for beneficiating to a high-grade furnace feed. Colorado Fuel & Iron Corporation has already acquired a large block of mining claims.

Today's successful prospector needs time, money, brains, and a faith in the future of the United States mining industry.

Transition of uranium to a free market may not be as painful as expected.

A balanced supply and demand for uranium is conceivable by 1968.

Critical factor is the military demand.

Here's how it could work out: according to one estimate, some 20,000 tons may be needed by 1968 to supply total peacetime demands for power, propulsion, and miscellaneous reactor uses. Another estimate places uranium oxide consumption for peacetime applications at 20,000 tons in 1965, and 40,000 tons in 1970. Weapons programs will demand an unestimable amount of uranium concentrate. If weapons demand for concentrate is only half of projected 1959 Free World output of 42,000 tons of U_3O_8, then supply and demand will be about in balance by 1968.

Technological advances are particularly significant in this costcutting era.

Bucket wheel excavation for open-pit mining continues to look more interesting every day. At least two important U.S. companies are intensively investigating problems relating to application of this German machine.

Blasting research by U.S. Bureau of Mines has indicated a new theory of rock breakage —rebounding tension waves may be the primary factor rather than the compressive effect of expanding gases. If this theory is true, our present blasting practices are open to re-examination to be sure we are obtaining the most efficient results.

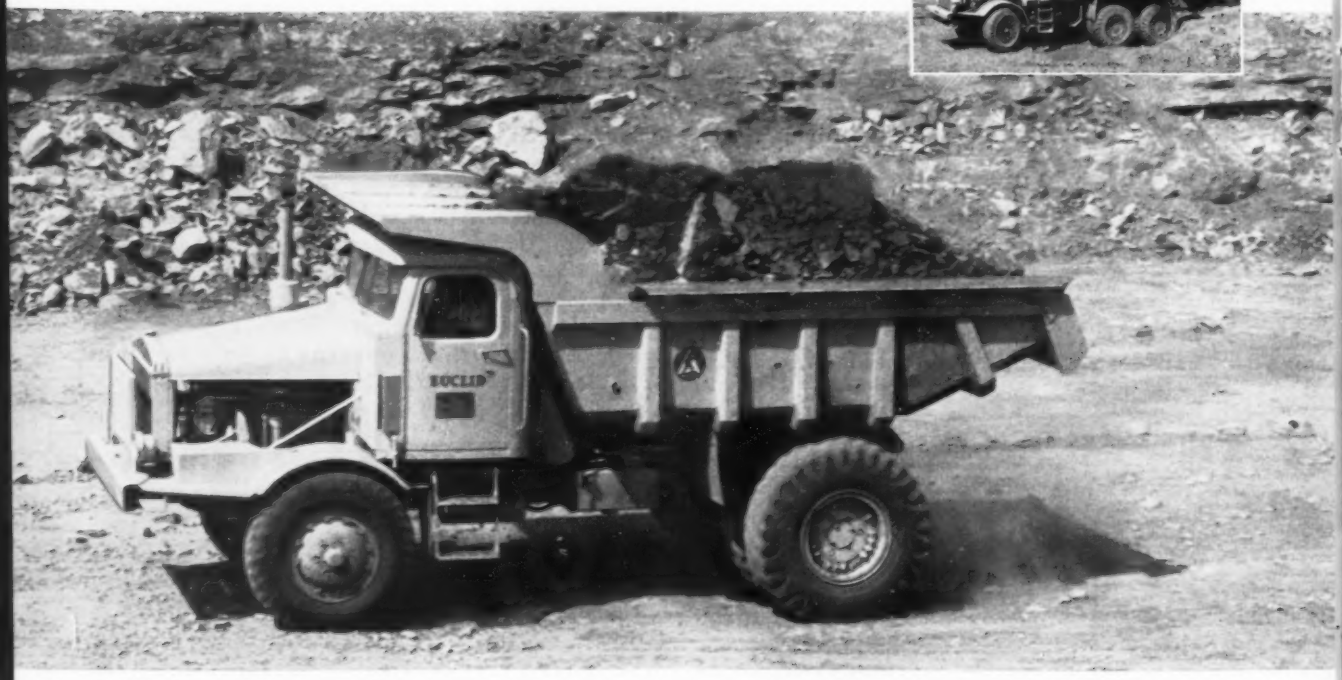
Drilling of shaft openings is proving more economical. Cost of American Zinc's 66-inch, calyx-drilled, ventilation shaft is reported at about $100 per foot. Average penetration per hour drilled is one foot. (See MINING WORLD, September 1957, page 60.)

Possible use of hydraulic jet stoping methods for recovering ore underground in the Ambrosia Lake district is under consideration. Sandstone grains are weakly cemented, and it's a well known fact that water is plentiful near the mining horizon so hydraulic jet stoping would turn a liability into an asset. It appears, too, that acquifer layers are replenished at a high rate.

A two-plane method of aerial electromagnetic surveying has been developed by a Swedish firm. Wide spacing between transmitter coil in one plane and receiving coil in second plane gives deeper penetration.

It's a fact . . .

"EUC" REAR-DUMPS HAUL AT LOWEST COST!



Here's Why . . .

For 25 years Euclid Rear-Dumps have been the outstanding choice of contractors, mines and quarries. They outnumber competitive off-highway haulers by close to a 4 to 1 margin. This unequalled field experience, backed by continuous product improvement, results in operating and maintenance advantages that enable "Eucs" to haul at lowest cost. These bonus benefits are not always apparent — seldom are, in fact — when you simply compare specifications, but they're mighty important to owners.

Tops in Availability

Downtime records invariably show that "Eucs" have unusually high availability and require a minimum amount of service and repair. This ability to stay on the job cuts costs, too, in standby equipment and in maintenance personnel and facilities.

Parts and Service Unequalled

With a large machine population, dealers can logically provide complete parts stocks and service but with a small number of machines in an area, extensive parts and service facilities are not economical. Generally, parts and service are available to owners of equipment in close relation to the number of machines in the territory. On this score—which has a direct bearing on the production and hauling costs of equipment—the Euclid dealer is your best source for Rear-Dump haulers, because his larger machine population justifies complete service and parts stocks to keep the equipment producing at lowest cost.

You can depend on "Eucs" and your Euclid dealer for everything that contributes to lowest cost hauling. That's why ***Euclids are your best investment.***

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EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

Capitol Concentrates

Asbestos, Fluorspar Producers Would Benefit From Dirkson Bill

Senator Dirkson of Illinois has introduced into the Senate S. 3186 a companion bill to the House bills to extend until December 31, 1959, the asbestos and fluorspar programs provided for in Public Law 733. The co-sponsors on the bill are Senators Allott (Colorado), Bennett (Utah), Carroll (Colorado), Goldwater (Arizona), Hayden (Arizona), Watkins (Utah), Murray (Montana), and Mansfield (Montana). It will be noted that the sponsorship covers the principal producing states and is completely bipartisan.

Reports are said to indicate that the Interior Department and the Bureau of the Budget are agreeably inclined toward the bill, although this will not be officially known until reports are transmitted to the Senate Interior Committee to which the bill was referred.

Tungsten was not included in the legislation introduced as it is impossible to secure funds for buying tungsten as long as Representative Kirwan of Ohio is chairman of the House Interior Appropriations subcommittee. In fact, the inclusion of tungsten might easily result in the loss of the bill. Kirwan is reported to have objected to the inclusion of tungsten among the metals on the exploration list of the Defense Minerals Exploration Administration when the appropriation for DMEA was being discussed. There no doubt will be a good deal of pressure from owners of tungsten mines to include tungsten in the new bill, hoping for a miracle which would convince Kirwan that he should provide the funds. A careful survey of the situation indicates that as long as Kirwan remains in the House and in good health the position of tungsten is hopeless.

• New Chairman States His Position

Representative Wilbur D. Mills, the new chairman of the House Ways and Means Committee, is expected in general to follow in the footsteps of his predecessor, the late Jere Cooper, at least as far as renewal of the Trade Agreements Act is concerned. However, he apparently has some doubts about applying the act too rigidly where domestic industries are being injured. On January 23, 1958, Representative Mills said:

"Although I have always supported the Trade Agreements program, I have in recent years become increasingly concerned as to the operation and administration of the various provisions designed by the Congress to afford avenues for relief to domestic industries which are being injured or are threatened with injury from imports due to concessions made in trade agreements. While I am a firm believer that an expansion of our international trade is of vital importance to the strength of our own economy, as well as that of other nations in the Free World, I am also concerned that due consideration, as was intended by the Congress, be given to those domestic industries which are injured or threatened with injury from imports. At the same time, I have questions as to the advisability of granting authority to increase rates above the 1934 level as proposed by the Administration. I want to make it clear that I have an open mind as to the form which this extension should take. The hearings will develop information and recommendations which will be carefully considered before our committee finally acts on this proposed extension."

This statement of Representative Mills would seem to bear some comforting words for those who believe that the escape clause in the Trade Agreements Act should be liberalized and who think that the White House has dealt too harshly with such favorable recommendations as the Tariff Commission has thought fit to transmit to the President.

• Opposition Evident From New Quarters

Some of the opponents of the movement to increase lead-zinc tariffs have done a good job of arousing the authorities of the various ports of entry. For example, the Congress is being circulated intensively with anti-tariff literature by the Norfolk Port Authority, which filed briefs before the Tariff Commission in opposition to tariff relief for lead and zinc. Its latest effort is a broadside in favor of continuing the Reciprocal Trade Agreements Act of 1955 for 11 years. The Administrative proposal is for five years.

It seems likely that any extension at all will meet with the strongest opposition it has ever had in this session of the Congress. Some people are predicting that the act will not be extended, but it appears that all of the Administration's strength will be behind the extension plus some of the free-trade Democrats. Even though there will be a big fight, the chances are the act will be extended for at least two years.

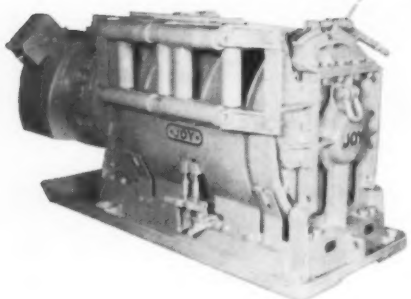
• Russia Reports On Nonferrous Output

An interesting note from Russia:

"The Russian Federation has fulfilled the annual plan for production of nonferrous metals including lead, zinc, magnesium, tin and aluminum. The workers of nonferrous metallurgy have completed ahead of schedule the production plan of the most important kinds of nonferrous metals in 1957. A considerable amount of aluminum, magnesium, lead, zinc, tin and other kinds of nonferrous metals will be produced above the plan."

What? No cutbacks?

MEDIUM IN SIZE . . . LARGE IN CAPACITY
A NEW CONTINUOUS-RATED SLUSHER FROM JOY



The C2F-211A is a *new* kind of slusher. It is the size of a medium capacity machine . . . compact and portable enough to move from place to place in the mine. Yet, it approaches large capacity slushers in load lugging ability and hour-after-hour stamina.

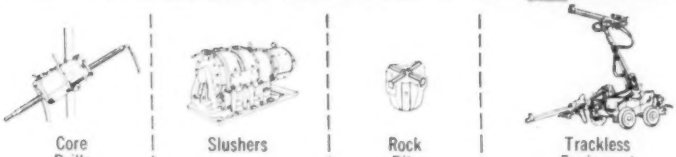
To meet extra-heavy digging requirements this newest Joy slusher is powered by a 50, 60, or 75 HP high-torque, high slip, flange-mounted motor. The high torque developed pulls the scraper through the pile without stalling. By eliminating repeated stalling and starting, fewer shock loads are imposed on the machine. Other features, such as *three* idler gears in each drum's planetary system provide 50% greater capacity.

Depending on motor horsepower and rope pull desired, rope speeds range from 165 to 350 feet per minute. Find out more about the C2F-211A, the new medium-sized slusher that hauls the bigger scraper loads. Write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW M 6703-183

WRITE FOR FREE BULLETIN 183-8

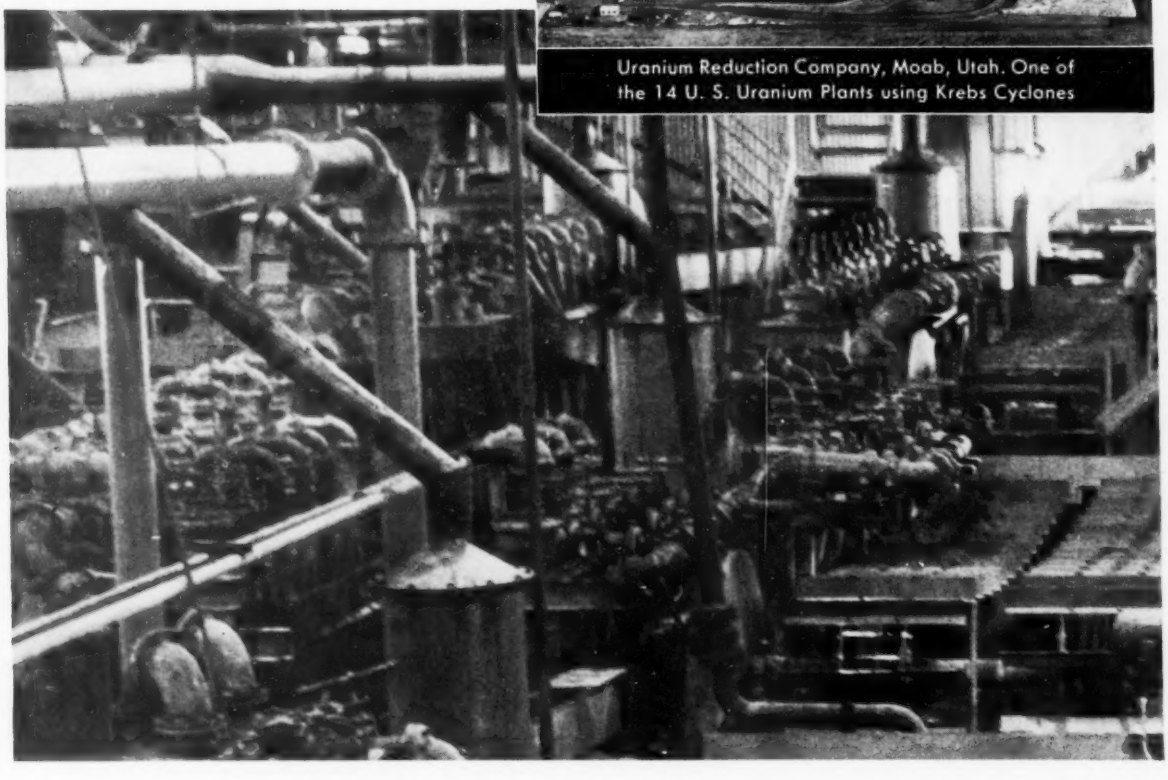
JOY **. . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY**



Core Drills | Slushers | Rock Bits | Trackless Equipment

Uranium Reduction standardizes on KREBS CYCLONES for sand-slime separation

Uranium Reduction Company, Moab, Utah. One of the 14 U. S. Uranium Plants using Krebs Cyclones



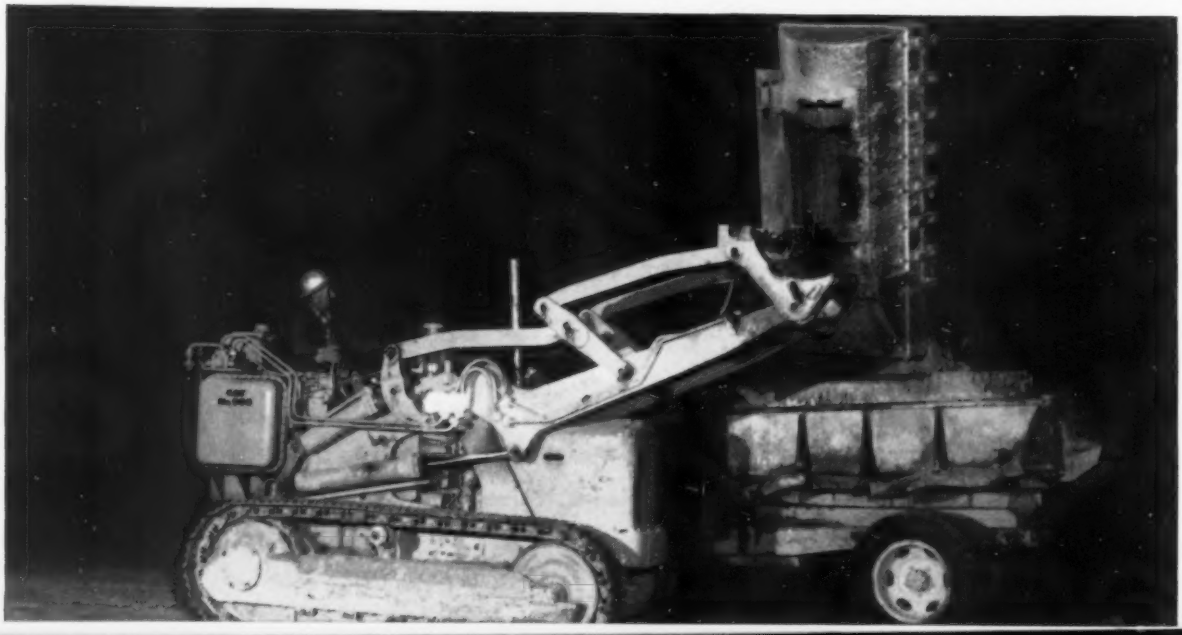
Multiple banks of Krebs D6B and D10B Cyclones are used for complete counter current washing of the fine sand-slime separation at Uranium Reduction Company, Moab, Utah. Final overflow product from D6B Krebs Cyclones goes to the RIP circuit at minus 20 microns at the rated 1500 TPD capacity. Very fine sands of the isolated CCD cyclone systems, consisting of banks of D10B Krebs Cyclones, join the coarser sands to the tailings. The Metallurgists and Superintendents of Uranium Reduction visited Equipment Engineers Pilot Plant at Palo Alto, California, to observe full unit scale studies which were subsequently duplicated in the Moab plant. We invite your inquiry on the possible application of cyclone classification to your operation and offer the services of our Pilot Plant for full scale investigations.

EE PRODUCTS

EQUIPMENT ENGINEERS INC.

41 SUTTER STREET SAN FRANCISCO 4, CALIFORNIA

Manufacturers of Krebs Cyclones, Valves and Clarkson Feeders



WHEN MINING OR QUARRYING CALL FOR FAST, CLOSE-QUARTER LOADING—

Operators such as Floyd Davis like the Cat No. 955 Traxcavator with Side Dump Bucket because they can see where they are casting, and operator movements are kept to a minimum.

perfect answer is a CAT-built Traxcavator with Side Dump Bucket

This No. 955 Traxcavator with the new Side Dump Bucket Attachment is loading limestone for the Southwest Lime Co. near Neosho, Mo. Because of its in-line loading capabilities—just power it forward and reverse, no turning—it is easily able to do the work of *two* other machines (HT4s). Working underground in quarry rooms where turn space is at a premium, this speedy Caterpillar unit dumps both forward and to the left.

The new Side Dump Bucket is available for the Cat No. 977, No. 955 and No. 933 Traxcavators, with bucket capacities of 2¼ cu. yd., 1⅝ cu. yd. and 1⅛ cu. yd. respectively. Where you need elbow room, particularly in underground work, these durable units can't be matched for low cost-per-cu.-yd. material handling. And the Side Dump Bucket is interchangeable with the standard bucket—same pins, bolts and nuts used for mounting both.

In the limestone mining job shown here, the faster cycle time of the Side Dump Bucket unit is important because trucks haul the stone 300 yd. to the crusher. A slow loading operation could slack off the whole job. In other operations, too, these agile units keep production high . . . backfilling trenches, loading asphalt or concrete, removing snow and ice, excavating loose material.

Side Dump Bucket Gives You—

1. Less maneuvering. Just a simple forward-reverse movement
2. Good view of loading field so operator can cast accurately
3. No turning to load
4. Reduction of loading area
5. Option to dump left or forward
6. Ability to load small trucks with minimum spillage
7. Minimum operator movement and cycle time

Phone your nearby Caterpillar Dealer today for a Side Dump Bucket demonstration. It has created a new dimension in earthmoving and materials handling, and will cut costs on *your* job.

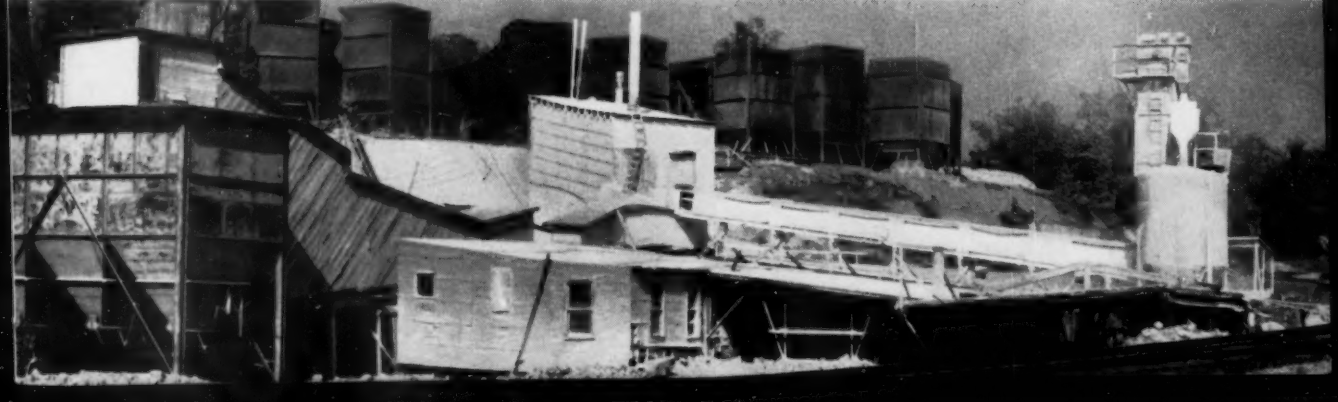
Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

INCREASE JOB PROFITS WITH CAT-BUILT MACHINES

This quarry site of the Southwest Lime Co. is producing about 700 tons of limestone per day for shipment to Kansas City for steel production. The Cedarapids crusher breaks the rock down to 7-in. lumps or smaller, before it is burned and shipped.



AT CONSUMERS COMPANY'S QUARRY

P&H ELECTRICS PROVE

In the 100-ft. deep mammoth Consumers Company limestone quarry in McCook, Illinois, this 5 cu. yd. P&H Electric Shovel is proving to be a vital link in the production of crushed stone. This P&H Model 1500 loads a steady stream of 15-ton trucks to keep crushers operating 'round-the-clock.

This maximum availability coupled with a minimum of maintenance is typical of P&H performance in important mines and quarries throughout the world. That's why leading operators are choosing P&H Electrics for both new installations and replacements.

Comparison tests have proved that two exclusive P&H features pay off in *continuous profitable production:*

MAGNETORQUE, the electro-magnetic type coupling that transmits power from hoist motor to dipper for faster action, greatly reducing shock and impact to the hoist gear train and motor.

ELECTRONIC CONTROLS, the fastest acting type of control available on electric shovels, providing the smoothest, quickest production cycle known.

With P&H you get single source responsibility . . . another distinct advantage experienced only by users of P&H Electric Shovels. P&H designs, manufactures and applies all electric rotating equipment specifically for electric shovel service.

P&H ELECTRIC SHOVEL LINE: 3½ through 10 cu. yd. capacities

HARNISCHFEGER

Construction & Mining Division
Milwaukee 46, Wisconsin

THEIR RUGGEDNESS IN ROCK

This impressive installation at Kiruna, Sweden, demonstrates a major benefit of ASEA Multi-Rope Friction Hoists: *low initial installation cost.*

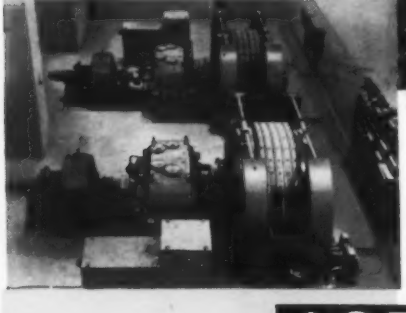
Each of these ASEA Hoists has a skipload of 22 tons and is designed for a depth of 1500 feet, maximum speed 2200 feet per minute.

At Kiruna, as in mining operations throughout the world, ASEA Multi-Rope Hoists prove less costly to operate, safer, and they reduce rope wear.

In the U.S. these advantages may be seen in the ASEA installations of National Potash Co. and Cleveland Cliffs Iron Ore Co.

9 HOISTS IN ONE HEAD FRAME

Total capacity: 4600 tons per hour



FULLY AUTOMATIC, the ASEA Hoists at Kiruna eliminate the employment of hoist men. At U.S. wage rates, assuming two-shift operation, this would mean a saving of about $30,000 yearly for each hoist!

Write for illustrated literature on ASEA Multi-Rope Friction-Drive Mine Hoists.

ASEA *... world pioneer in electrical products for industry*

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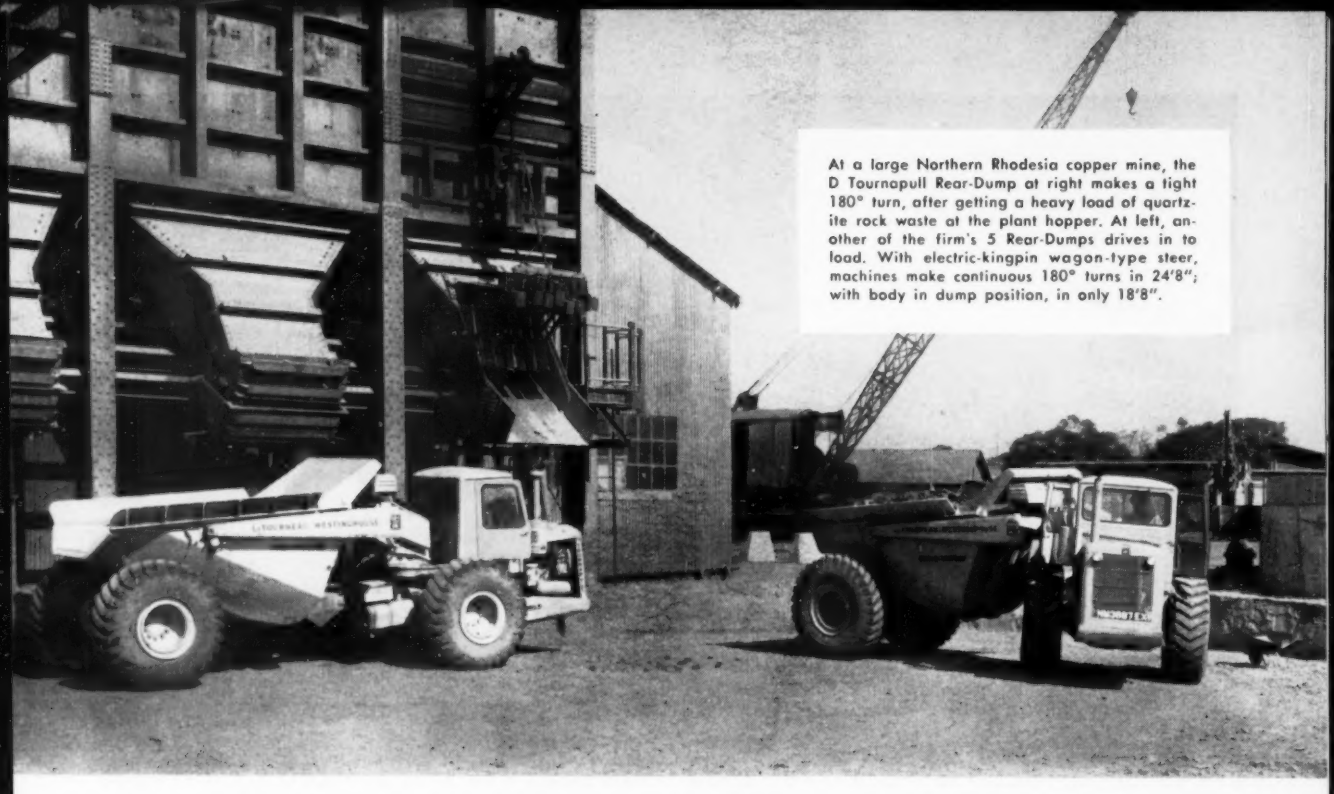


At a large Northern Rhodesia copper mine, the D Tournapull Rear-Dump at right makes a tight 180° turn, after getting a heavy load of quartzite rock waste at the plant hopper. At left, another of the firm's 5 Rear-Dumps drives in to load. With electric-kingpin wagon-type steer, machines make continuous 180° turns in 24'8"; with body in dump position, in only 18'8".

Large Rhodesian copper mine

solves waste rock disposal problem with high-speed haulers

The foundation of Northern Rhodesia's economic structure is copper. At one of the larger copper mines in this southeastern African country, five 138-hp D Tournapulls with 11-ton Rear-Dump bodies work all the year around hauling waste rock to the crusher or dumps. This is how these LeTourneau-Westinghouse pivot-steer haulers perform:

Haul 1 mile to dumps

Electric-controlled Rear-Dumps are loaded to capacity with waste rock (mostly quartzite) from bins at the ore separation plant. Units haul over dirt roads to various dumping points within a radius of 1 mile. Here the operator presses an electric switch on the dashboard, activating the hoist motor. The Rear-Dump body lifts immediately. The tip of the bowl swings low behind rear wheels, to dump material over the edge of a waste pile, or into a crusher grizzly. Then these 29.5 mph haulers return for another load.

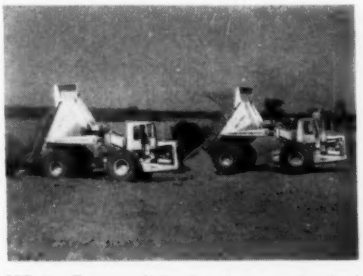
Working an average of 6 hours per day, Tournapull Rear-Dumps haul 22,401 tons per month.

High efficiency, regardless of footing

At this large copper mine, the weather is dry and dusty 6 months of the year; the remaining 6 months have heavy rains. But the efficiency of the Tournapull haulers remains high, regardless of footing. The principal reason is that the big-tired, 2-wheel prime-mover is equipped with the famous power-transfer differential, which automatically shifts power from the slipping wheel to the wheel with a better grip.

Lower your hauling costs

For low-cost hauling of heavy materials over any type footing, in any kind of weather, you will want to investigate LeTourneau-Westinghouse Tournapull Rear-Dumps. Available in three sizes: 11, 22, and 35-ton capacities. Write for complete information.



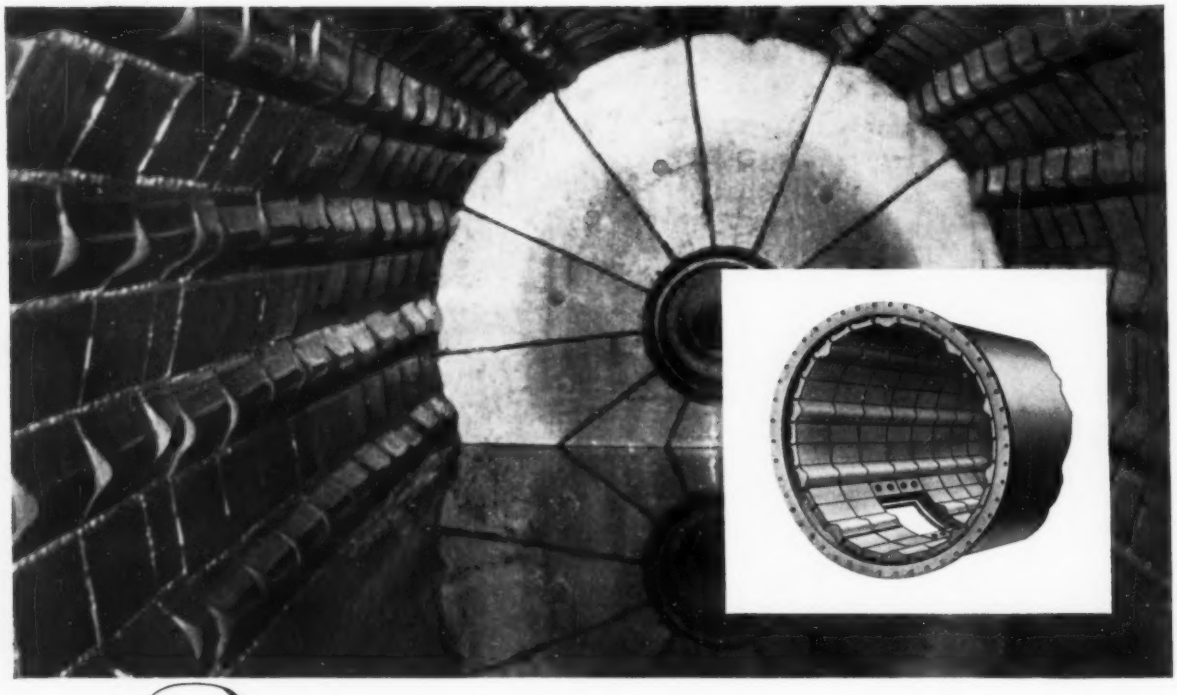
138 hp Tournapull hauler dumps a load of waste rock over a bank, as a second machine starts 1-mi. trip to the loading area. With front-wheel drive and powerful 4-wheel brakes, units can back safely to the edge of banks. The operator dumps load clean at the touch of an electric-control switch on the dashboard.

Tournapull—Trademark Reg. U.S. Pat. Off. DR-1763-MJ-1r

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



8 Reasons Why You Should Standardize with B&W Universal Liner Plates

Better Performance with Lower Costs—Same Casting Fits All Mill Sizes

B&W Tube Mill Liners reduce capital, time and labor costs. Consequently, they reduce the cost of the material ground. Here are eight reasons why:

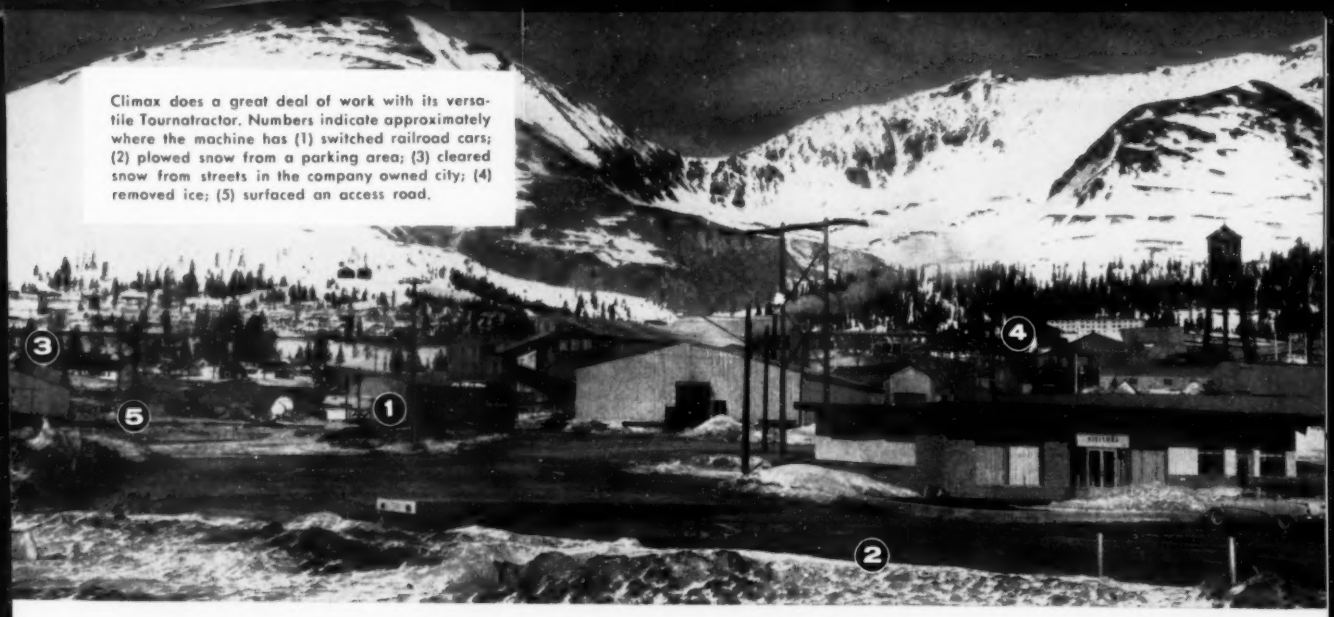
1. Lower Initial Costs—standardization eliminates chiller and pattern costs.
2. Longer Life For Liners—better quality control on a mass production casting, utilizing permanent molds, results in uniform wear. Ideal size for uniform chill and heat-treatment.
3. Longer Life for Different Applications—this is assured by selection of proper materials. Design is suitable for either chilled irons or wear steels.
4. Reduced Costs in Both Direct Labor and Outage—installation time is less because small size and weight of castings allows them to be handled easily, without cranes and with less fatigue for workers.
5. Reduces Costs in Storage Space—because small castings stack easily, little storage space is required. One design of casting interchangeable for all size mills also simplifies records.
6. Reduced Costs in Liner Inventory—standardization is possible because one design fits all diameters of mills. Standardization means quicker unloading and storage.
7. Reduced Costs on Breakage Claims and Delays for Replacements—small castings are rugged and almost impossible to break by handling. Large castings of hard, brittle irons sometimes break in shipment.
8. Reduced Costs in Determining Most Efficient Wear Patterns—you can get wear profiles consisting of all lifter ribs or all flats from the same castings, as well as a combination of both including straight or spiralled lifter pattern.

Liners are supplied in two nominal thicknesses, 1½" and 3" with 1½" high lifters. Castings are 6" wide x 12" long. Positive seating of small castings on mill shell means less breakage of castings under operating conditions. For additional information on B&W Universal Tube Mill Liner Plates write The Babcock & Wilcox Company, Process Equipment, Barberton, Ohio.

S-471

BABCOCK & WILCOX

BOILER DIVISION



Climax does a great deal of work with its versatile Tournatractor. Numbers indicate approximately where the machine has (1) switched railroad cars; (2) plowed snow from a parking area; (3) cleared snow from streets in the company owned city; (4) removed ice; (5) surfaced an access road.

Why Climax Molybdenum Company changed to tractor-on-rubber at world's largest underground mine

High up on the Continental Divide in the Colorado Rockies, in the U.S.A., Climax Molybdenum Co. operates the world's largest underground mine. Its mountainside location, 11,320 feet above sea level, offers a difficult test for the tractors Climax uses to maintain 15 miles of roads, and to service 150 acres of mine and surrounding community area. Temperatures often dip to 35° below zero. Snowfall last winter measured 30 feet.

Fastest, most powerful tractor in the Climax fleet is a LeTourneau-Westinghouse Tournatractor, purchased in 1954 to replace a big crawler unit. The reason Climax changed to this speedy 210 hp rubber-tired tractor is explained by Superintendent Burton Baumann:

"The snow and ice here make crawler upkeep just too expensive," he says. "A set of tracks lasts only a year. So we bought this rubber-tired Tournatractor to have a machine that would end that problem, a dependable machine that could work in snow without getting stuck.

Tournatractor has met those requirements completely. After 3 years of service, during which time it has built and surfaced roads, built a tailings-pond dam, removed ice, switched railroad cars, and done a tremendous amount of snowplowing, Climax men say these things about it:

Superintendent Bauman: "We like the tires as compared to crawlers. We used chains the first year, have not used them since. Tournatractor can handle 95% of our tractor work. The Tournatractor's maintenance record has been excellent, too. Actually, with our preventive maintenance program (we try to catch little things before they become major problems) after 3 years of work, we still have had nearly 100% availability of our Tournatractor."

Assistant Ray Lykins: "Tournatractor will plow as much snow as 3 crawlers, and leave the area clean. It is as fast as our truck plow, too. And on job-to-job travel, it takes only about 20 minutes to cover a distance that would take at least 45 minutes with a crawler. Cold weather starts are no problem at all."

Operator Bob Flower: "It is a much easier machine to ride on than a crawler. The operator does not experience nearly as much jar. "It is faster and easier to control. The cab is very warm, even in below zero temperature. Tournatractor is very easy to operate!"

Write us for details on how the 17 mph, 210 hp LeTourneau-Westinghouse Tournatractor can solve varied tractor problems on your mining operations.

During the month of May, high up on the mountainside, Tournatractor clears the remains of winter's 30' snow at Climax Molybdenum mine, Climax, Colorado. This big, rubber-tired tractor "clears as much snow as 3 crawlers" according to mine officials.

Tournatractor—Trademark Reg. U.S. Pat. Off. CT-1599.MJ-1r

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Now! The BOYLES BAZOOKA

Drills wherever a man can find a footing!

No mounting problems

Yes, this lightweight Super-efficient new BAZOOKA needs no back support. It bores in and does a big job where no other Diamond Drill could be mounted.

The BAZOOKA is engineered to eliminate mining bars and sprags. It delivers top performance in raises and in stopes. Quickly unhooked and replaced on Eye-bolt Anchor avoiding interference with other mining operations such as tramming.

The BAZOOKA is better than air-leg type drills because its Eye-bolt Anchor and Bipod Mounting keeps drill in line and aids immensely when adding rods or removing rods from the hole.

Works wonders on top of muck pile, on scaffolds, in spots where short hole testing is required

The BAZOOKA'S 16 horsepower motor provides ample power for blast hole or core drilling with high penetration rate.

The BAZOOKA can be easily moved, set up and operated by one man with a minimum of operator fatigue.

WIRE, WRITE or PHONE BOYLES about the BAZOOKA on your operation — today.

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DRILLING COMPANY LTD.
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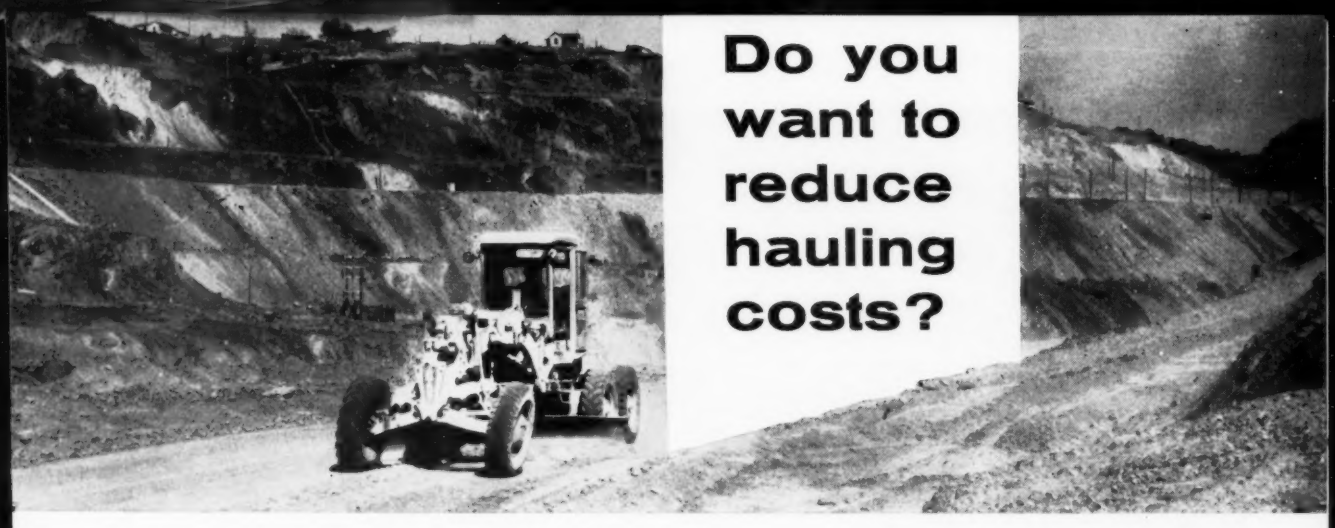


Do you want to reduce hauling costs?

How 15-speed motor grader can help your haulers make more trips every day

You will reduce the cost of hauling, increase pit output every day, by hauling at higher speeds. Faster haul speeds are practical *only* when your pit floor, benches, and haul roads are kept clean, smooth, and well drained. The better your surface, the faster you can haul, the more trips you can make per day, the lower your pit-haul costs.

To keep your haul routes in good condition you need motor graders that can do maximum work. You need machines that can make heavier cuts, push bigger loads, work and travel faster, machines that can always work in tough materials at near full power. This requires a wider range of more selective gear-ratios than most graders afford.

More speeds for full-power work

Only Adams 80 to 150 hp graders give you the extra work speeds you need. They provide 8 standard speeds forward and 4 reverse, plus 3 creeper gears (optional). That is 15 speeds in constant-mesh transmission.

For building and maintaining haul roads, ditching, and cleaning up at pit, plant, and stockpile, the Adams grader provides 4 forward working speeds. Other graders with 6 forward speeds have only 3 working gears, often cannot develop full push-power at the faster speeds that are correct for the job.

An Adams grader's 2 intermediate gears, 10 and 14 mph, are useful for light, fast blading, snow plowing, maneuvering and climbing difficult grades. And travel speeds to 26 mph save time between grading assignments, time that can be used for extra blade-work.

Up to 30% more cycles on one-way grading

Most graders have only 2 reverse gears, about 3 and 7 mph. Adams graders have 4 reverse speeds, 2 for working, 2 for backing up fast. Adams graders' fastest reverse speeds (8 and 13 mph) prove very profitable. Often your operator works a 200′, 400′ or longer stretch, that is too short or too confined to make 180° turns worthwhile. Instead, he backs up. The Adams grader makes the reverse trip fast, converts usually wasted travel time to productive use.

Creeper gears for precise grades

Three optional creeper speeds, 31′ to 160′ per minute (full power, 0.41 to 1.82 mph), afford a means to concentrate full engine power for ripping up and regrading old roadways, pioneering for exploration and new roads, clearing overburden of stumps and roots and working through rocky ground. They eliminate overuse of the clutch to obtain maximum power at slow speeds, and therefore reduce clutch wear. Creepers also help you to grade more accurately, and to work in confined areas.

190 hp POWER-*Flow* 660

For maximum push-power *at all speeds*, Adams POWER-*Flow* Model 660 with torque converter gives you the effective work-power of an *infinite* number of gear ratios, from 0.0 mph to 27.4 mph forward.

Any one of the 6 Adams grader models (190, 150, 123, 115, 85, 60 hp) will handle more work for your investment. There is a size to fit your grading problems in any type of pit and plant situation. We shall be pleased to send you more information on receipt of your request.

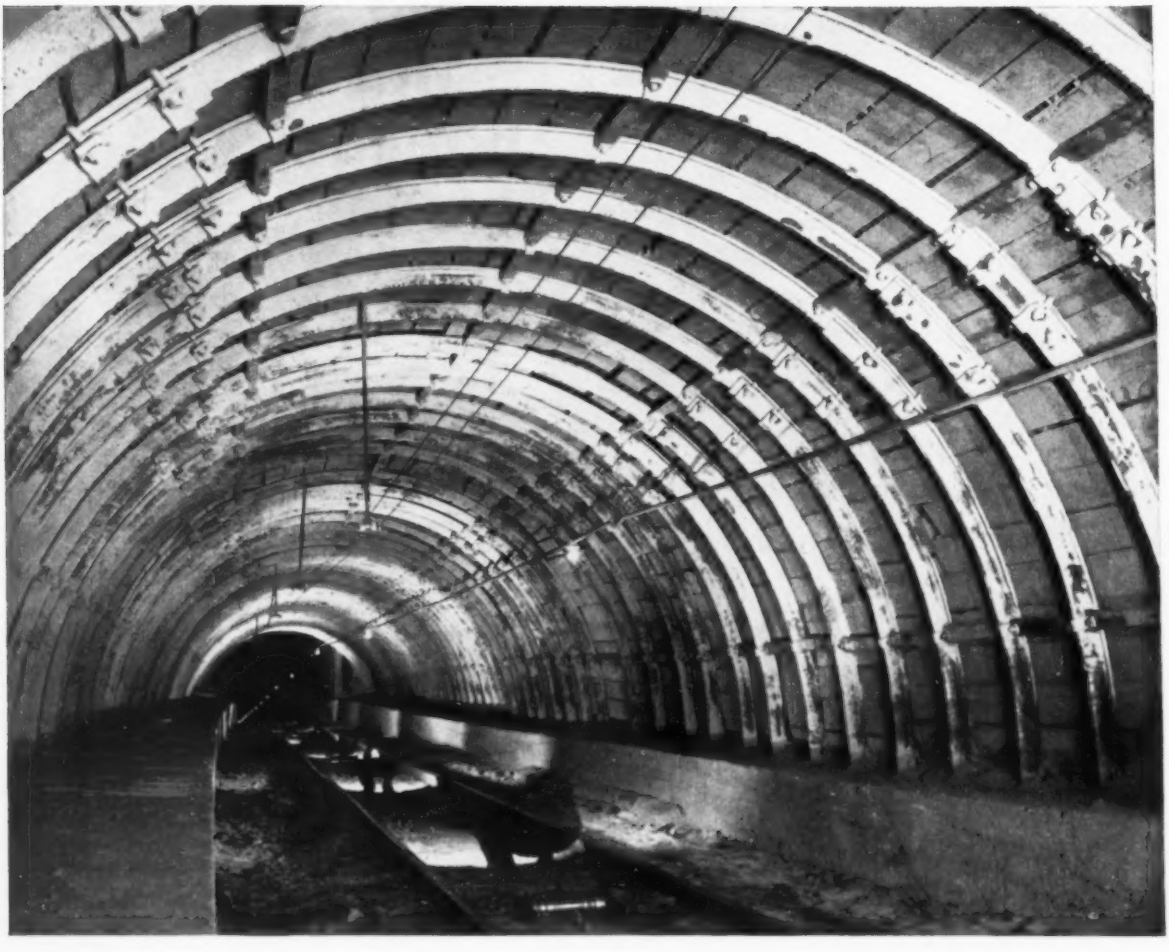
Adams graders can handle more of your type of jobs, save time and money with efficient interchangeable attachments. These include: *Scarifier* for ripping-up old roadways and rock-filled soil, *bulldozer* for spreading and casting dirt and road materials, *snow equipment* for clearing roads, *push-plate* for push-loading scrapers and starting balky haulers.

POWER-*Flow*, Adams—Trademark G-1626-MQ-1r

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



How to hold up a mine roof of sandstone and shale

Here in this Western coal mine haulageway is an outstanding example of Bethlehem Yieldable Arches at work. The overburden runs between 1450 and 1600 feet thick, and the material immediately surrounding the opening is soft shale and sandstone which, without support, would cave from sloughing.

In order to keep the haulway safe until the seam could be mined out, the mine operators installed Yieldable Arch sets on 2-ft centers, along with an unusually neat job of lagging. Because the Yieldable Arch is designed to "give" gradually, rather than break or let go, these sets helped to induce a natural arch in the overburden and bring peripheral forces into equilibrium.

Each Yieldable Arch set is made up of segmental U-shaped sections which nest together to form an overlapping joint. The joint is secured by heavy U-bolt clamps, thus providing the yieldability feature. The degree of yieldability is determined by the tightness with which the bolts are drawn up.

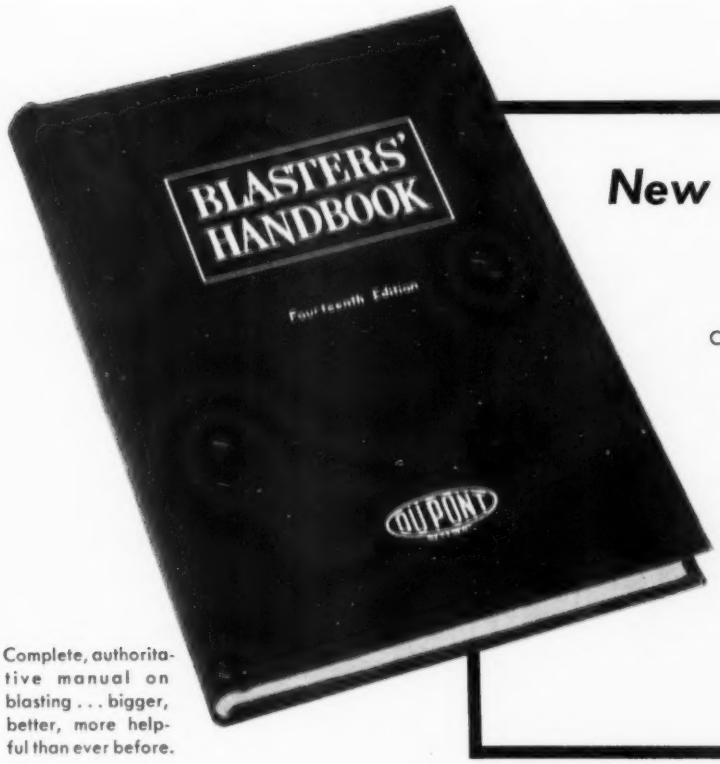
Yieldable Arches usually outlast timbers or other rigid supports. Because of this and their high recoverability, they can be counted upon to repay their original cost rapidly. Some mines have found that their Arches paid for themselves within six months! A Bethlehem Pacific engineer will gladly discuss roof-support with you in terms of your own particular problems. He can be reached through our nearest sales office.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales Offices: Los Angeles, Phoenix, San Francisco, Portland, Seattle, Spokane.

BETHLEHEM PACIFIC

BETHLEHEM STEEL



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- Firing electrically
- Firing with "Primacord"
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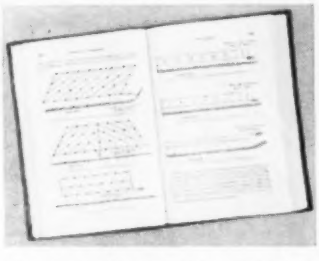
And the officially approved Institute check list of "Do's and Don't's" helps you provide maximum safety on the job. Your "Blasters' Handbook" can go right on the job with you. It has a durable "Fabrikoid" cover, and is indexed for easy reference.



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2543-G Nemours Building
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Please send a copy of the "Blasters' Handbook," for which I enclose check for $1.75. (Plus sales tax where applicable)

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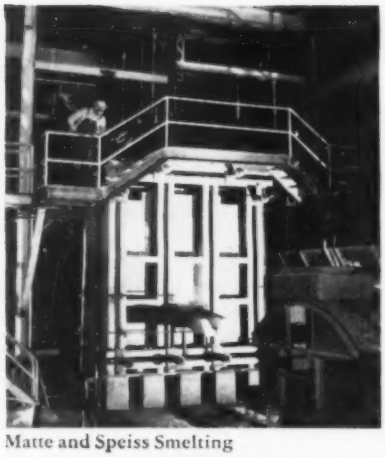
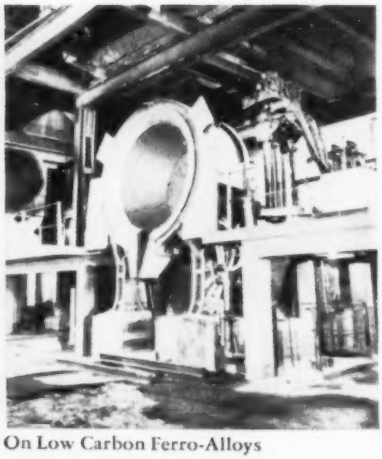


Matte and Speiss Smelting

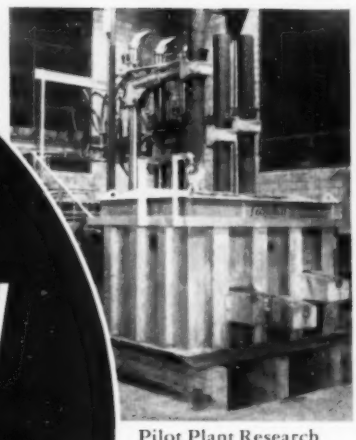
Copper Melting



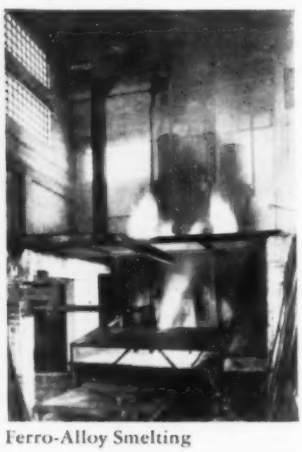
On Low Carbon Ferro-Alloys

Lectromelt* Furnaces really get around—

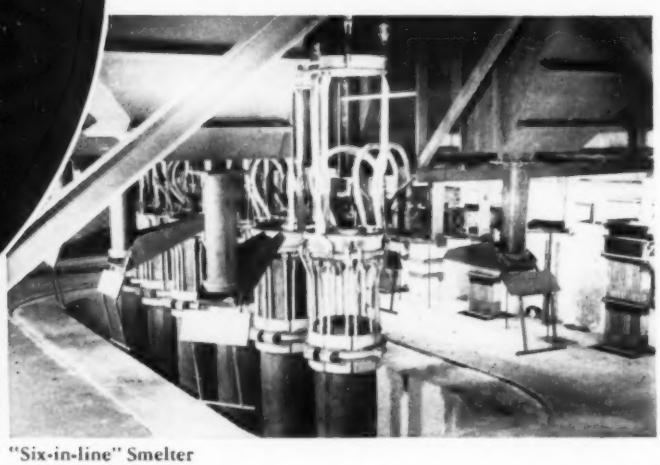
Catalog No. 105 describes furnaces for Smelting and Refining. For a copy, write Lectromelt Furnace Division, McGraw-Edison Company, 324 32nd Street, Pittsburgh 30, Pennsylvania.



Pilot Plant Research



Ferro-Alloy Smelting



"Six-in-line" Smelter

McGRAW EDISON

LECTROMELT FURNACE DIVISION

McGRAW-EDISON COMPANY

Pittsburgh 30, Pennsylvania

50-Rs Speed Mountain Top Removal At Huge Latin American Copper Mine

Fast-drilling Bucyrus-Erie rotary drills were put to use recently as Southern Peru Copper Corporation began blasting operations at its new mine located 100 miles inland from the Pacific port town of Ilo.

Before any ore can be mined, the company must remove the top from a mountain called Toquepala. Excavation amounts to some 120 million tons of rock and earth.

To get things going, seven 50-Rs were brought in for drilling blast holes. They are well equipped for the job. *Variable drilling speed* and *variable pulldown pressure* provide the resources for speedy drilling at Toquepala.

Ward Leonard variable voltage control gives the operator smooth, instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation without stopping the drilling operation. Hydraulically powered down pressure on the bit provides controlled load on drilling tools for maximum penetration.

These seven 50-Rs are electric rigs designed for drilling 9⅞ to 12¼-in. holes. For drilling 6¾ to 9-in. holes Bucyrus-Erie Company offers the 40-R with either diesel-electric or full electric power.

Get the full story on these drills today. Write direct for illustrated literature. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

74B58C

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

Moving 16,000 to 20,000 tons of

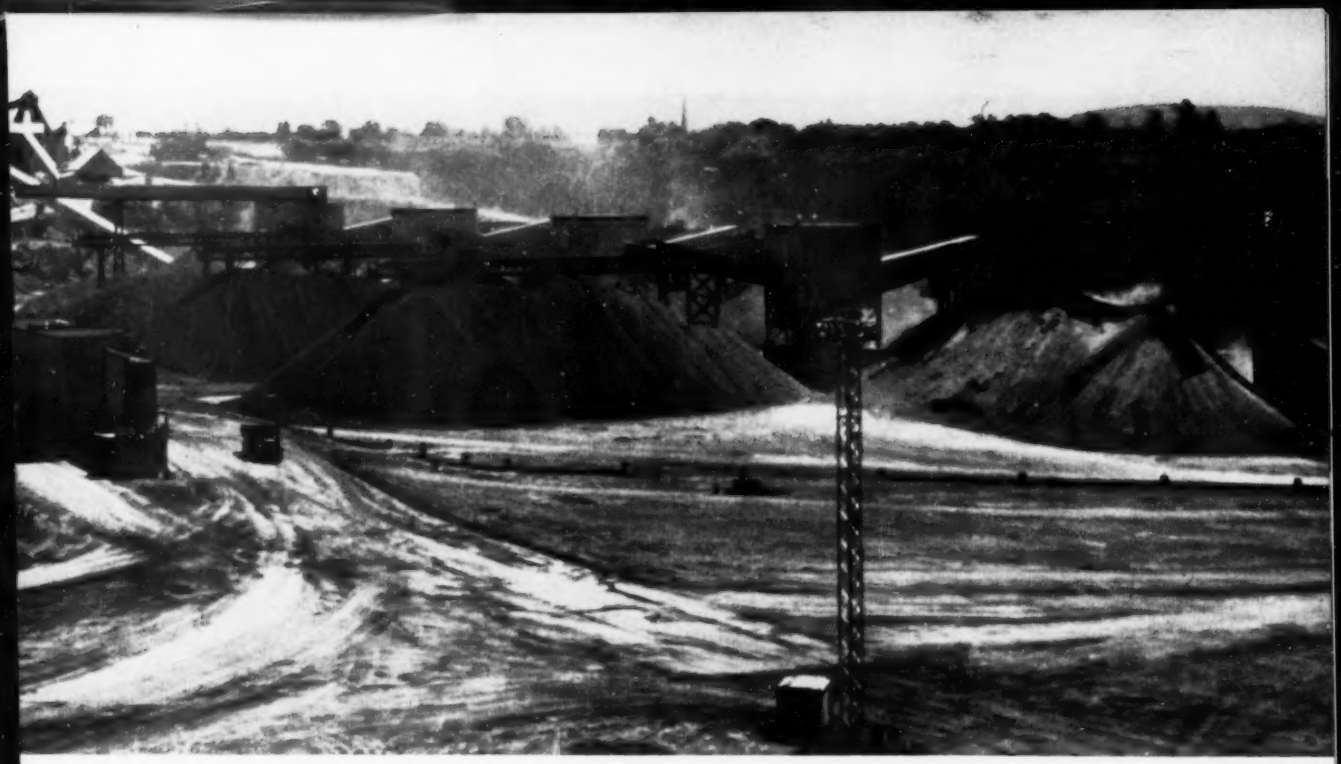
One of the biggest and most efficient stone-crushing plants on this continent is owned by The Highway Paving Company Limited of Montreal, which recently increased its capacity from over 400 tons per hour to over 1600 tons per hour.

Almost all of this operation is automatic. However, quadrupling production involved moving rock from quarry face to crusher in sufficient quantity to assure Highway Paving's booming operations of a continuous supply of crushed stone.

Seven Macks were given the job. Working under six-yard electric shovels, they shuttle from shovel to crusher, each making 10 trips an hour; the seven trucks average over 16,000 tons per day. The shovels really have to move to keep up with the hustling Macks, which are on the go 10 hours a day.

Highway Paving knows that its production of crushed stone is dependent on equipment that must maintain "the pace that kills", day after week after month, without crippling breakdowns. Their Macks

Mack being loaded by one of the six-yard electric shovels. The Macks take a brutal beating from the seven-ton impact of broken limestone dropped with each shovel pass . . . but come right back for more.



rock per 10 hour day with 7 trucks

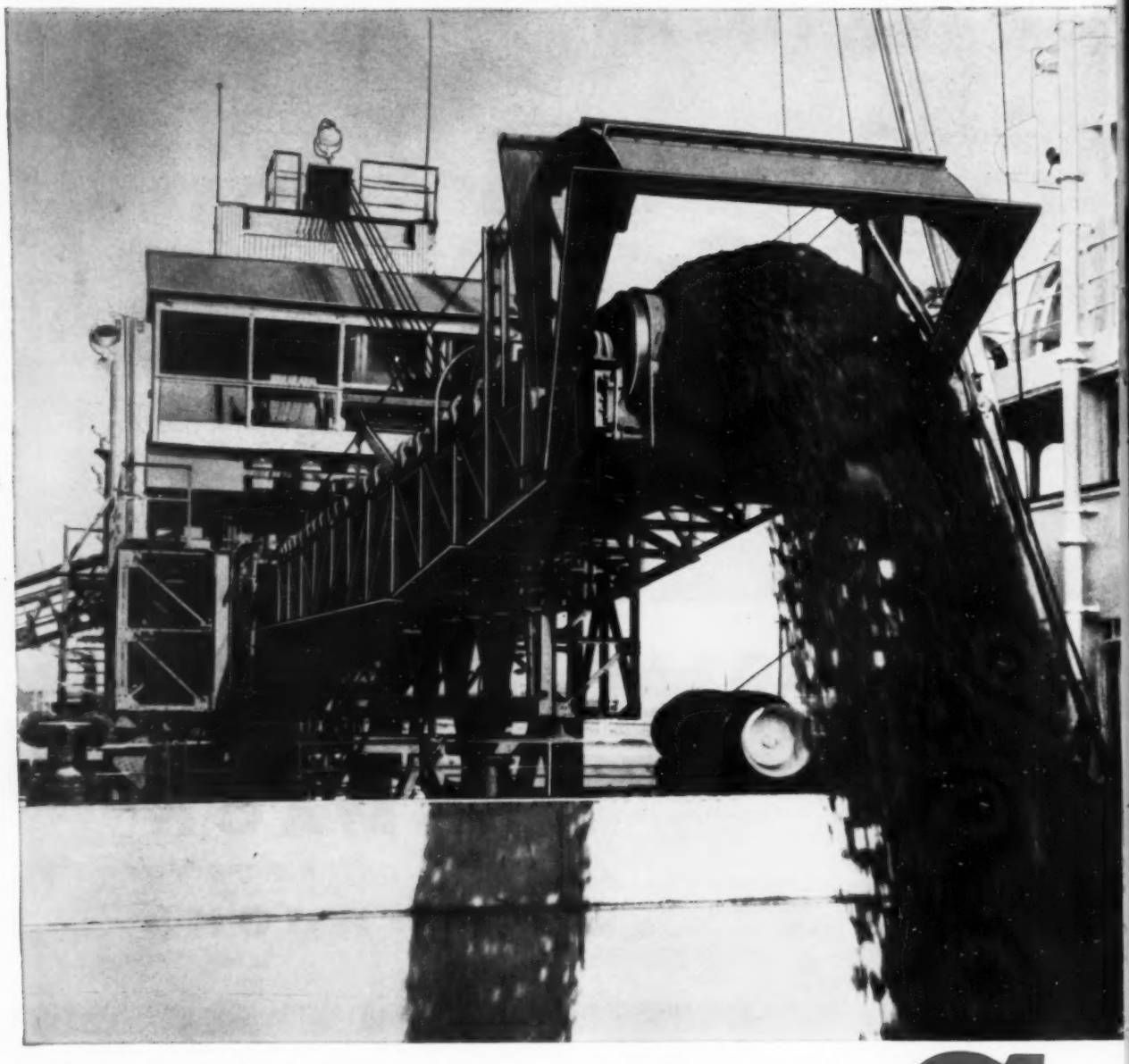
have proved that they are worthy of this dependence. In fact, no other make of dump vehicle is used in this quarry.

Macks have everything it takes for dependable, profitable quarry, mine or construction hauling. Your nearest Mack representative will be glad to give you the names of Mack users in your area who are racking up new production records, with minimum down time and top economy. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada. Ltd.

MACK
first name for
TRUCKS

5511

Dumping rock into Highway Paving's huge crusher which is so located that trucks can dump into it from both sides. Number of loads emptied into crusher are counted electronically, and tonnage crushed is determined by belt weighing equipment.

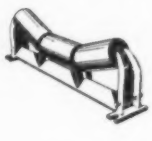


Part of a huge ore handling system at Seven Islands, Quebec, this is one of two 60" wide boom type belt conveyors which feed ore directly into a ship's hold. The twin boom ship loading system delivers 8000 T.P.H.

STEPHENS-

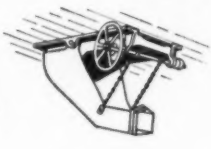
THE BIG NAME IN BULK MATERIALS HANDLING

BELT CONVEYORS

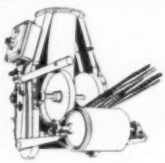


CARRIERS

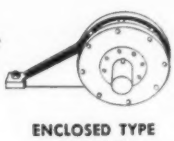
MANGANESE STEEL PAN FEEDERS



TUNNEL GATE



SWIVELOADERS



ENCLOSED TYPE HOLDBACKS

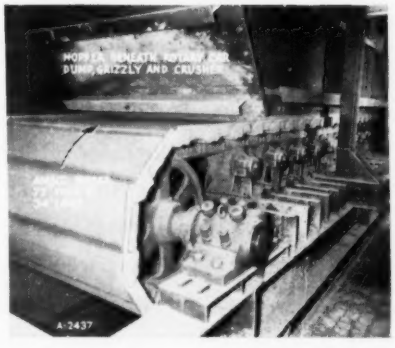
FROM MINE TO MILL--THE S-A WAY

Swift, economical handling of vast ore tonnages made possible with conveying equipment conceived and engineered by Stephens-Adamson

The fantastic ore tonnages being carried today from mine to mill, have been made possible largely thru the employment of ingenious conveying machinery. STEPHENS-ADAMSON is a chief contributor to the science of bulk materials conveying by developing concepts and equipment in general use today by metal, coal and mineral miners throughout the world.

Heading a long list of outstanding S-A engineering achievements is the first ball bearing belt conveyor carrier which made the long distance belt conveyor feasible. It opened the way for the most practical, lowest cost method of bulk material transportation ever conceived by man. The magnitude of this accomplishment is scarcely measureable in our era of high-speed production and insatiable demand for raw materials. As an appropriate sequel, S-A followed up by designing and building the longest underground belt conveyor system in the world!

STEPHENS-ADAMSON has earned its big name the hard way — with engineering skill — by building quality equipment for 57 years. That's why, if you have a conveying problem, your interests will be served best by the men who know conveying best — the men from S-A.



Car dump discharges ore to a grizzly which permits minus 5" ore to fall directly to this 72" wide AMSCO manganese steel pan feeder. STEPHENS-ADAMSON builds feeders in any practical width or length to handle any size ore lumps.

This S-A belt conveyor system operates at the 1200 foot level of a Menominee Range mine. It is the second of two similar conveyor systems installed since 1946. The 36" wide belt rides on S-A carriers. Capacity of the system is 250 T.P.H. with a belt speed of 200 F.P.M.

This 1200 foot long inclined S-A belt conveyor delivers primary crushed ore to storage at a secondary crushing plant. Belt is 48" wide and total lift is 190 feet. Headshaft is provided with an S-A hold-back to prevent belt reversal under load in case of power failure.

One of the finest ore unloading docks in the nation is at Curtis Bay, Md. The conveying system was engineered and built by S-A. Ocean-going vessels are unloaded and their cargoes delivered to waiting rail cars. Belt conveyor carries material almost 900 feet to car loading station.

-ADAMSON

EQUIPMENT

S-A district or main plant offices can supply complete information on any conveyor product or any phase of ore handling. Just write or call.

SINCE 1901 S-A STEPHENS ADAMSON MFG. CO.

MFG. CO.

MAIN OFFICE AND PLANT
13 RIDGEWAY AVENUE
AURORA • ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA
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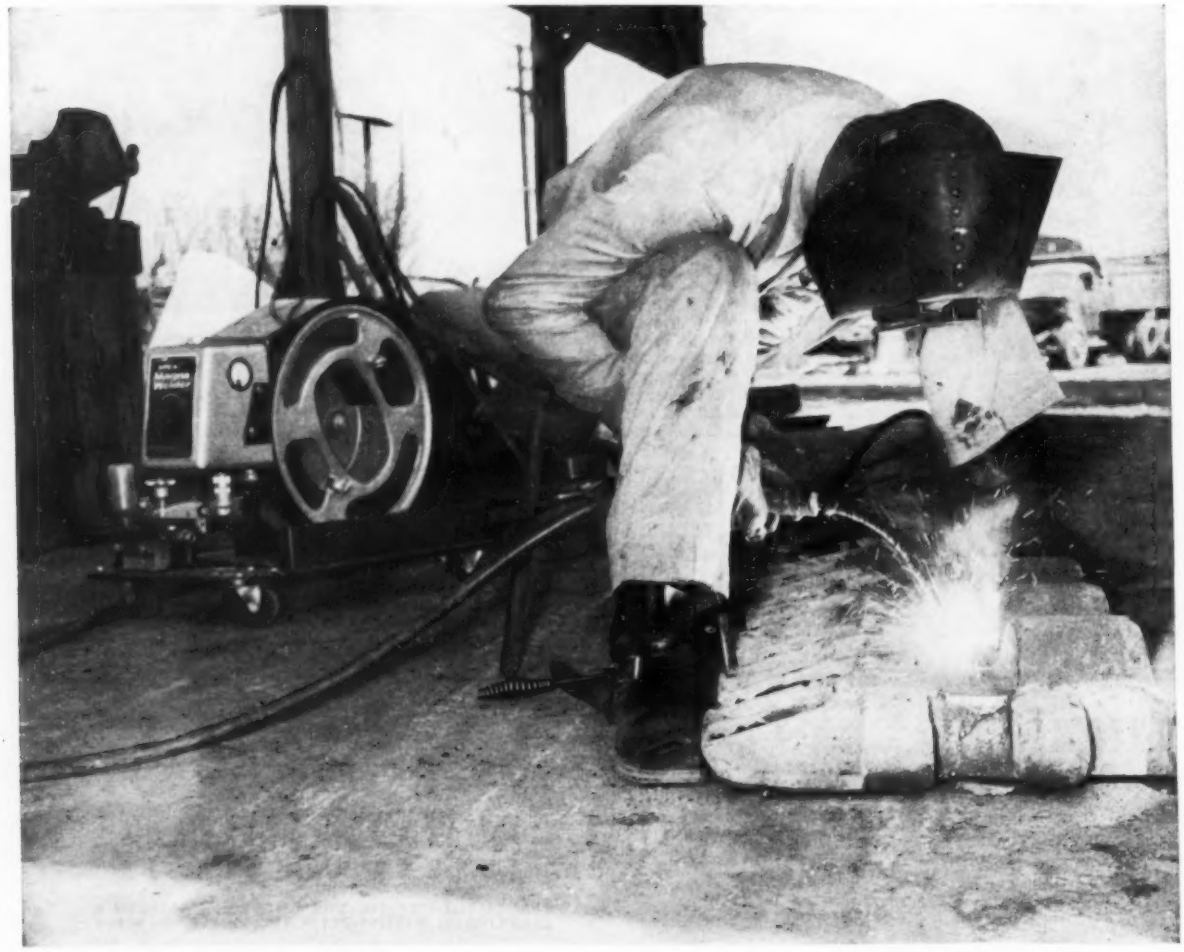
Stoody Semi-Automatic Hard-

- **with longer equipment life,**
- **less down-time,**
- **faster, easier reclamation of worn equipment!**

Everyone is always searching for *better, easier ways* to keep equipment in operation! Until the development of Stoody semi-automatic wires, maintenance hard-facing was limited to manual welding or fully automatic welding. Now, however, operators have a new tool which combines the advantages of *both* the manual and automatic processes with extreme flexibility of application. Hard-facing is usually applied directly without need for dismantling or positioning equipment. Speed of the process surpasses even automatic welding.

Weldor rebuilds shovel track pads with semi-automatic machine using Stoody Nickel Manganese wire to restore lost metal.



Facing Pays Off . . .

CONTINUOUS WELDING—Stoody semi-automatic wires are fed through any semi-automatic welder. Welding is continuous, without wasted stub ends or constant changing of electrodes. The wires are clean, bright, drawn to exact size and specially annealed for trouble-free feeding. Chemically coated papers prevent rusting in shipment.

COMPLETE WELD VISIBILITY—With open arc welding you see the weld as it is applied—vision is not hampered since most wires are fed bare. This means accurate welding and greater ease when working along edges or welding to a line.

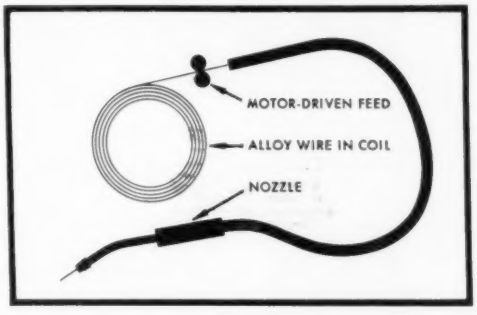
FASTER APPLICATION—High current density makes it possible to apply more pounds per hour. Usually the semi-automatic increases welding speed from 2 to 4 times! Lets you do those welding jobs that you've been putting off for lack of time.

HELPS ELIMINATE RUSH WORK—Faster application reduces the pile-up of work, takes the strain off your welding crew. Jobs go through smoother and easier. Rapid wearing equipment can be touched up during off time or between shifts.

EXCELLENT WEAR RESISTANCE—Stoody semi-automatic hard-facing wires are equal or superior in wear resistance to well-known Stoody manual electrodes of similar analysis. Low penetration causes less dilution with the base metal, therefore deposits are higher in alloy content, improving over-all wear resistance.

WIDE RANGE OF WIRES in low alloy to high alloy types gives you the only complete selection on the market, provides the one "best" wire for each wear condition . . . your assurance of *maximum protection per dollar invested!*

ASK FOR A SEMI-AUTOMATIC DEMONSTRATION! Our field engineers are equipped to demonstrate this new time, cost and labor saver right on your job. Arrange a date with your Stoody dealer! (Check the "Yellow Pages" or write direct.)



HOW SEMI-AUTOMATIC HARD-FACING WORKS Stoody semi-automatic wires are fed through the machine by motor-driven rolls. The motor is automatically actuated as the arc is struck. The weldor merely directs the deposit; wire feed is automatic and continuous as long as the arc is maintained. Certain wires are best applied by submerged arc, using the semi-automatic machine with a light positioner for full automatic welding.

Rebuilding tamps with semi-automatic machine. Pipe section is driven over worn feet, filled with Stoody 121. Cost is one-third of ordinary replacements . . . service life several times more.

Bucket lips, teeth and sides are hard-faced with semi-automatic welder without positioning work. Stoody 121 is generally recommended for position welding, as on bucket sides.

Impact breakers are readily hard-faced in position with the semi-automatic. Frequent applications are often necessary to maintain efficiency of crusher. Speed of application is important here.

Tooth from 5-yard bucket . . . repointer welded with Stoody Nickel Manganese and hard-faced with Stoody 121 by the semi-automatic process.

Carrying scraper blades, cutters and sides are most economically protected by use of the semi-automatic welder using Stoody 100 or Stoody 121.

STOODY COMPANY
11932 East Slauson Avenue
Whittier, California

for tough-screening jobs on construction sites, choose . . .

CF&I INDUSTRIAL SCREENS

Because they give you:

- **Maximum resistance to abrasion, vibration, fatigue**
- **Accurate screening**
- **Low downtime—long life . . . large tonnage output**

CF&I Industrial Screens can offer you all these advantages because they're made from specially selected steel that's crimped and woven extra tightly—to ensure high production even under the toughest operating conditions.

CF&I SPACE SCREENS

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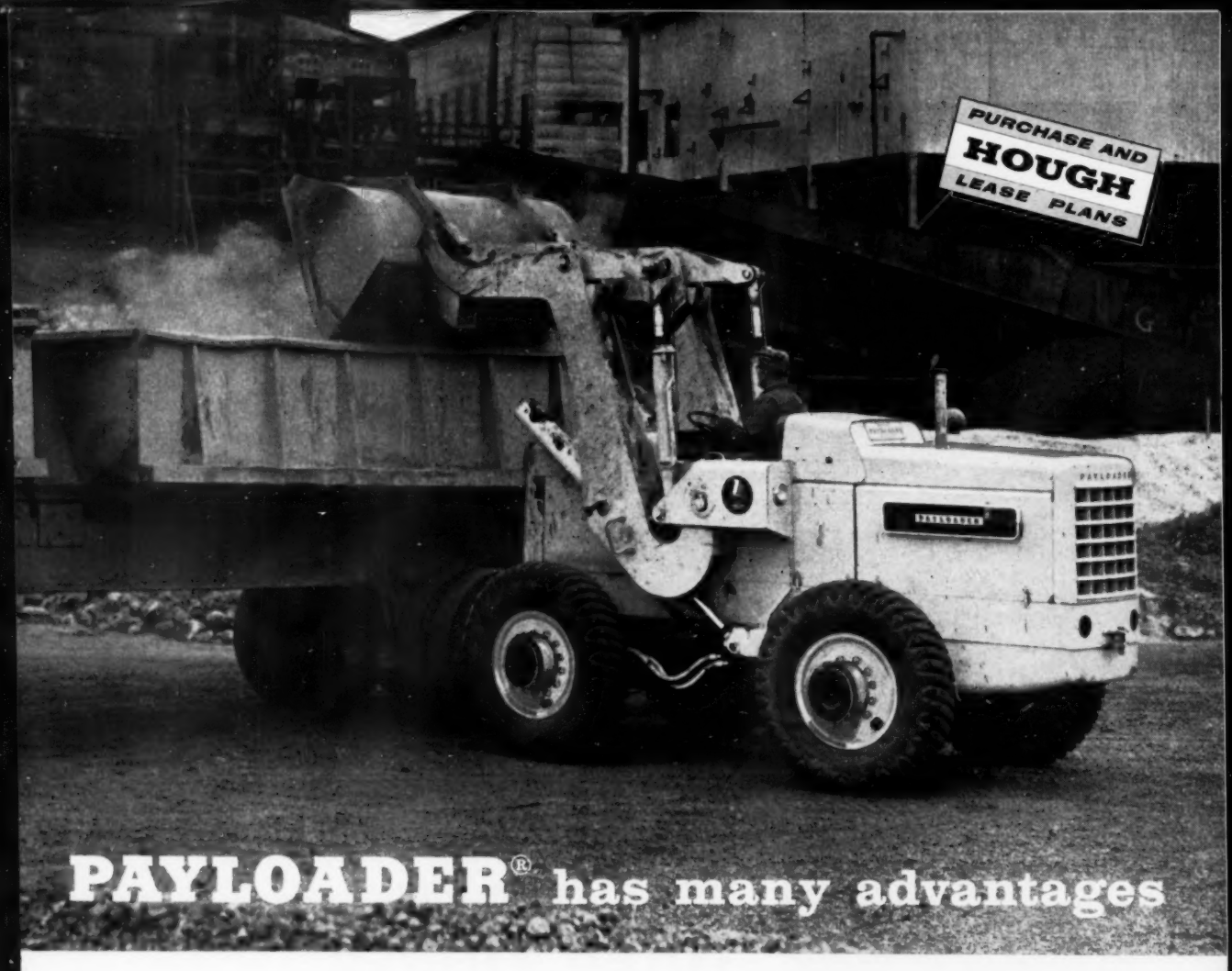


Fast on the Job

Handling manganese concentrates for example (illustrated) a model HO "PAYLOADER" loads 16 Tons in 2 minutes flat. Powerful 40° pry-out tipback bucket action gets full loads quickly. No-stop power-shift transmission gives fast, easy shuttling and maneuvering for highest handling speed. Hydraulic load-shock-absorber cushions loaded bucket — reduces spillage losses, allows faster load-carry speeds.

Fast to the Job

For scattered work, a 4-wheel-drive "PAYLOADER" moves quickly to wherever it's needed at speeds up to 24 mph.

Cleaner on the Job

The big pneumatic tires don't chop up working areas and haul roads — reduce dust hazards and maintain cleaner working conditions.

Reliable on the Job

Torque-converter drive reduces drive train shock . . . planetary final drives keep torque low in all drive-train parts for longer life and lower maintenance. Power-transfer differentials insure reliable traction on all four wheels.

Versatile on the Job

4-wheel-drive "PAYLOADER" units are working underground and above-ground . . . in pits, around concentrating plants, sinters and smelters. They load trucks and cars . . . carry, windrow, spread, bulldoze . . . spot and shift railroad cars, clean out tailings ponds . . . load, move and shift machinery and supplies.

There is a Hough Distributor in your area who wants to show you what a "PAYLOADER" can do on *your* job. Ask about Hough Purchase and Lease Plans too.

Modern Materials Handling Equipment

THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

SAY "HUFF"

THE FRANK G. HOUGH CO.

859 Sunnyside Ave., Libertyville, Ill.

Send 4-wheel-drive "PAYLOADER" data.

- ☐ Model HO (9,000 lb. carry cap.)
- ☐ Model HH (7,000 lb. carry cap.)
- ☐ Model HU (5,000 lb. carry cap.)
- ☐ Distributor's Name

Name.....

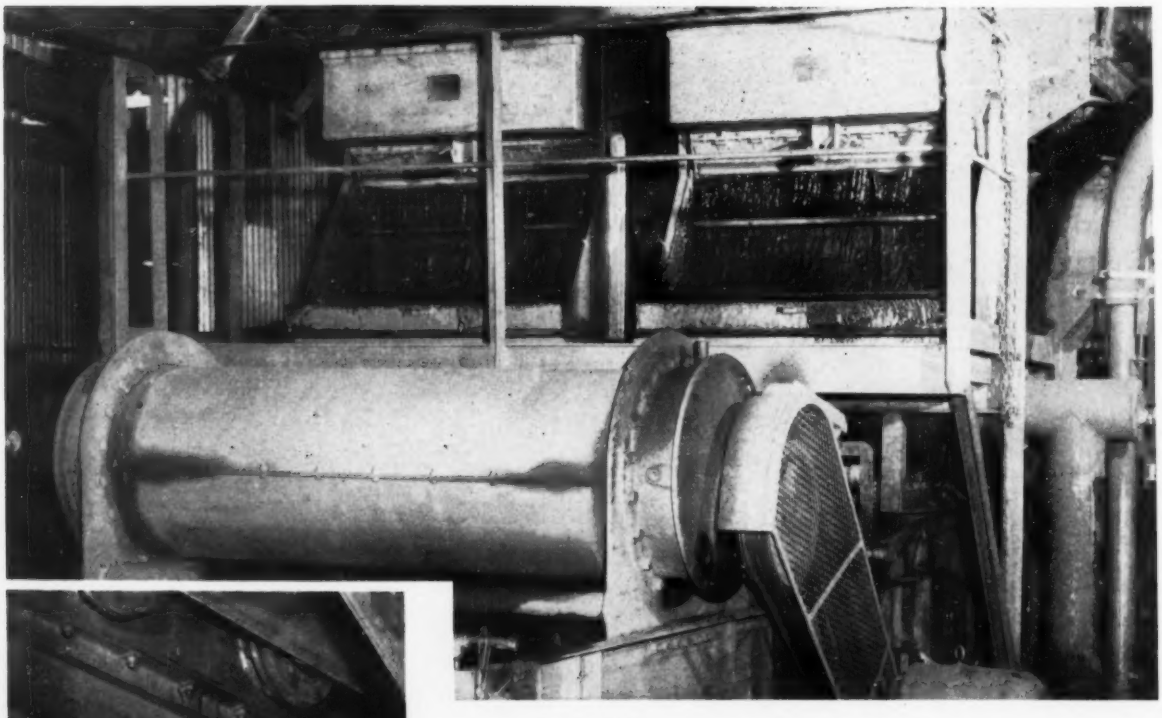
Title.....

Company.....

Street.....

City.....State.....

3-B-4



Rear view of unit, note total utilization of entire screen area.

magnetite medium losses reduced in heavy media cyclone plant on Mesabi Range with

DORR-OLIVER DSM SCREEN

One of the most serious operating problems in the beneficiation of low grade iron ore in heavy media cyclone plants is high magnetite medium losses and difficulties in maintaining a clean medium free of non-magnetics.

At the Mesaba-Cliffs Mining Company's Holman Concentrator at Taconite, Minnesota, the Dorr-Oliver DSM Screens applied to screening of magnetite from cyclone underflow concentrate and overflow tails have consistently reduced the amount of medium sent to the cleaning circuit by 30 to 50% and reduced medium losses thereby approximately 20%.

Key to the marked superiority of the DSM Screen over conventional screening methods is the non-blinding wedge bar screen, fabricated to tolerances of ±.0015 inches; profile design is such to provide maximum screen life. Capacity of the 4′ wide units installed at Holman Concentrator is 75-100 gpm per ft. of screen width when handling minus 8 mesh to 0 material at 70% solids.

For complete information on this newest tool for the mining industries, write for a copy of Bulletin No. 2300. Dorr-Oliver Incorporated, Stamford, Connecticut.

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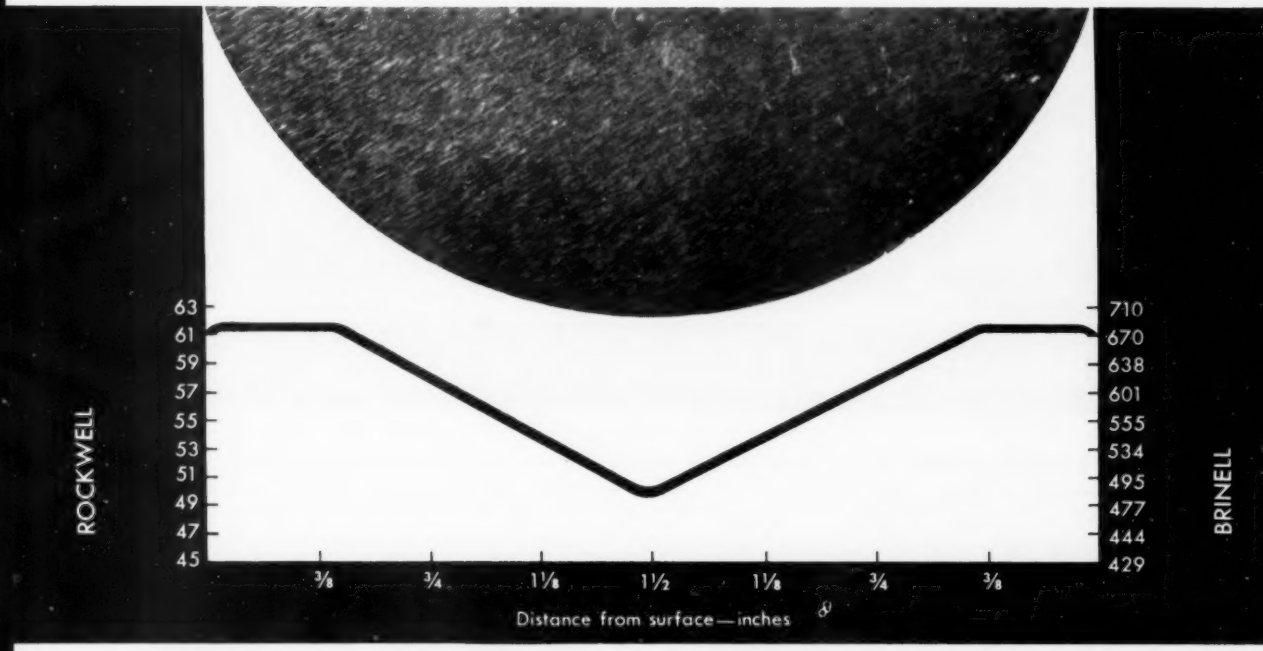
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

controlled metal hardness means

heat-treated cast alloy steel

NACO GRINDING BALLS

cut per-ton grinding costs



Note how new casting process and full heat treatment show controlled hardness between surface and inner core.

Spectrographic analytical control of elements in steel making processes and controlled heat treatment assure the desired metallurgical grain structure which produce the type of hardness required for maximum wearing qualities.

Performance reports on Naco solid cast alloy steel grinding balls from mills now using them have been universally favorable—both in lasting qualities and impact absorption.

Structurally, they possess a grain closely approaching tool steel—tough, hard and rugged for long lasting qualities. Laboratory tests show a remarkable uniformity in solidity, both under X-ray and specific gravity tests, with controlled hardness holding to a desired depth.

AA-5059

CAPITOL FOUNDRY DIVISION

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Post Office Box 750, Phoenix, Arizona

GENERAL OFFICES • CLEVELAND 6, OHIO

Established 1868

Allis-Chalmers TS-160

7 yd struck

9.5 yd heaped

155 horsepower

5 speeds to 25.4 mph

12-ton payload

Measure these advantages for

22 hp per struck yard—Big Allis-Chalmers supercharged diesel engine delivers extra lugging ability for tough pulls, fast loading. Versatile TS-160 can team up with big equipment or work alone on long- or short-haul construction jobs—handle a wide range of utility jobs, travel at speeds up to 25.4 mph.

Measure these features... Allis-Chalmers 516-cu-in. diesel engine—dependable power at all working speeds • Independent, constant live hydraulic power for steering and scraper operation • Low, wide bowl—8-ft, 1½-in. cutting edge . . . 3-piece, interchangeable cutting edges . . . double-acting hydraulic bowl lift jacks • Positive hydraulic ejection, high apron lift to full 7-ft, 1½-in. opening • Roomy operator's compartment, easy-to-reach controls, 24-volt direct electric starting, adjustable bucket-type seat, synchronized 4-wheel air brakes • Big push block for all types of pushers.

a wide range of earth-moving jobs...

Turns non-stop in less than 25 ft with 90-degree hydraulic steering . . . easy maneuverability in narrow cuts, faster cycles without reversing in tight turn-arounds.

Moves quickly from job to job . . . when required, transport wheels are available to meet legal load limits for highway travel.

ALLIS-CHALMERS CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

leave the "leg-work" to Gardner-Denver

Gardner-Denver air feed leg drills waste no time or effort in helping speed production. They're safe . . . easy to handle . . . and drill out fast. Here's why:

- Adjustable feed leg pressure provides proper feeding for horizontal and up-hole drilling.
- Drill controls grouped on the back head for ease of operation.
- Push-button air release in feed leg backs the drill off fast after drilling out.
- Constant chuck-end blowing air keeps cuttings from entering drill.
- Gardner-Denver automatic water control provides "water on—air on, air off—water off" drilling cycle.
- Leg is easily positioned to support drill in rigid stoper bracket.
- Drill quickly removed from leg for use as sinker.

Write for bulletin on Gardner-Denver's time-tested air feed leg drills today.

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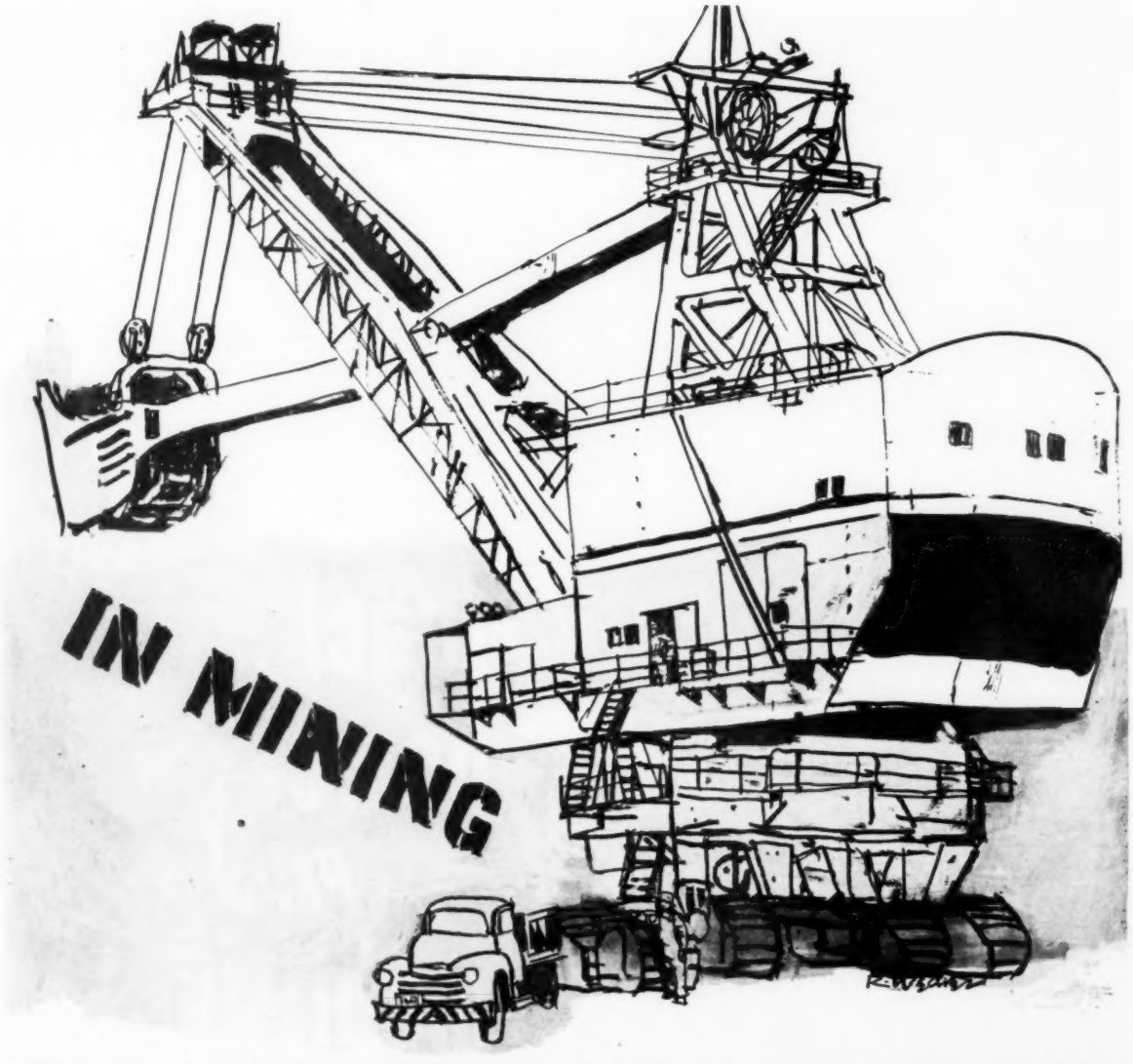

NOTHING **TRANSMITS POWER** AT SUCH LOW COST FOR **SO LONG** AS ROEBLING ROYAL BLUE WIRE ROPE. No means of transmitting power can be compared—on a cost basis—with Royal Blue, the strongest wire rope you've ever used. Meeting stringent service demands is a function fulfilled by Royal Blue in many ways: unimpaired flexibility, great resistance to shock, abrasion and impact—a plurality of qualities that make for singularly long service life. For further details on "length through strength," communicate with Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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DESIGN
FOR WIRE ROPE
Its ready adaptability is evident wherever power is transmitted. It conforms to unique design requirements. Use wire rope to transmit power.

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Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

5½-yd. SHOVEL DELIVERS TOP PRODUCTION IN TIGHT QUARTERS

Capacity alone is not the only measure of a real mining shovel . . . ability to move overburden *anywhere* at lowest cost can be a deciding factor. The Manitowoc 5½-yd. Model 4500 shovel is engineered from the crawlers up as a true mining machine . . . combining long reach, big capacity and reserve power with the all-important mobility to get in and work in close quarters.

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CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

New Chemical Tools for Ore Processing From Cyanamid's Research Laboratories

Have You Evaluated These New Products?

At Cyanamid's Stamford, Connecticut Research Laboratories a task force of almost 1,000 people is continually striving to develop new products and application methods for our chemical consumers. The Mining Chemicals research staff is part of this group. Listed here are some products currently available as a result of their efforts. It may be profitable to evaluate these new reagents, if you have not already done so.

AERO® Promoter 765 — Readily emulsifiable fatty acid promoter, particularly effective in low-temperature pulps. Ease of emulsification and feeding improves performance and collecting efficiency; often effective at lower dosages than regular fatty acid. Commercial quantities available.

CYQUEST 40® Sequestering Agent — Chelating agent which complexes bivalent and trivalent cations. Useful as modifier in oxide flotation. Commercial quantities available.

Reagent S-3107 — Acid-circuit copper promoter. Available in research quantities only.

Reagent S-3135 — Acid-circuit copper promoter. Bulk sulfide promoter. Available in commercial quantities.

Film-Forming Reagent S-3152 — Applied as a spray, it sets up to form a protective crust over mineral and coal fines preventing wind and rain erosion. Commercial quantities available.

Reagent S-3160 — Low molecular weight, water soluble, synthetic polymer. Functions as slime dispersant, sequestrant and flotation modifier. Especially effective in cyanidation to prevent lime scale formation. Pilot-plant quantities available.

Reagent S-3185 — Fungicide, bactericide, algaecide—may be used for preventing mold and bacteria growth in tailings ponds, water reservoirs, ion-exchange systems, etc. Also acts as promoter for certain silicates and HgS. Pilot-plant quantities available.

Reagent S-3193 — Low molecular weight, water-soluble synthetic polymer with same possible applications as S-3160. Available in research quantities only.

Samples and technical information on request from our nearest office.

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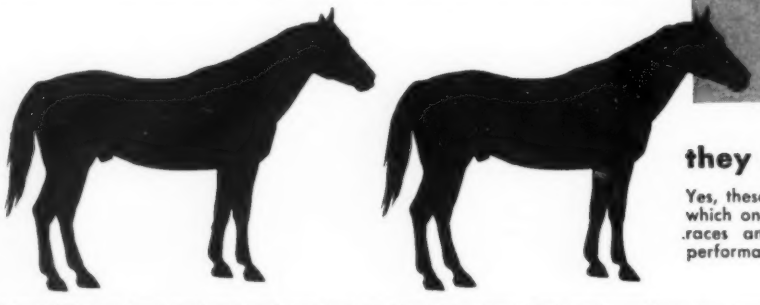
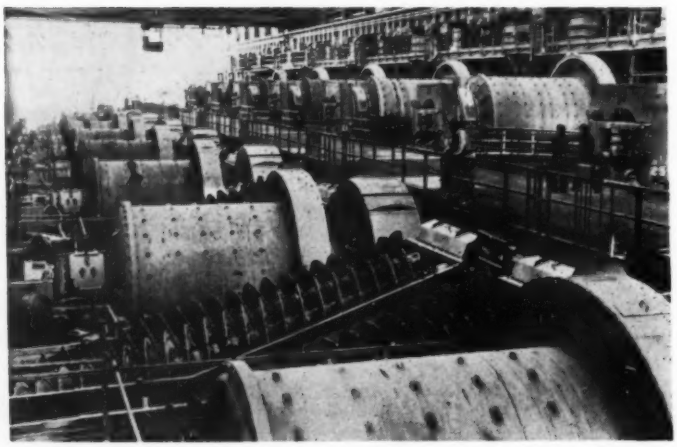


they may look alike!

Yes, these two quarter horses do look alike! But, which one has the breeding and training to win races and a proven record of championship performance?

Grinding Mills Specs May Read Alike, too!

Yes, grinding mills may look alike...manufacturer's specifications may read quite similar. But, which manufacturer has the specialized **grinding** experience, the engineering, the manufacturing "know-how," to build **grinding mills** with a **proven** record of outstanding performance? Which manufacturer is willing to show you the real specifications behind the proposal?



Take Meehanite Metal for example. Your Marcy Mill will have Meehanite heads as well as other **important** parts cast of this metal. Meehanite's uniform density, high tensile strength, fatigue strength, rigidity, and impact strength provide qualities of toughness and resilience which are essential in grinding mill construction. But, remember the importance of having manufacturer's specialized experience in the use of Meehanite on **grinding mills.** Mine and Smelter's foundry has developed casting techniques to produce various types of Meehanite having pre-determined properties...each best suited for the particular **grinding mill** application.

The importance of this specialized engineering and manufacturing experience applies, of course, to all parts of the mill.

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March 1958

INTERNATIONAL PANORAMA

BLIND RIVER, CANADA—A new company has been formed by Rio Tinto Mining Company of Canada Ltd. and Dow Chemical Company of Canada Ltd. to recover thorium and rare earths as byproducts of uranium recovery in the Blind River district—world's largest uranium district.

VLADIVOSTOK, USSR—A new tin mining and milling operation has started near Lake Khanka 100 miles north of here. Russia has expanded tin production and exports recently. About 12,000 tons of tin will be sold on world markets in 1958, according to qualified observers.

OTTAWA, CANADA—The Emergency Gold Mining Assistance Act will be extended to December 31, 1960 by the Canadian government. In 1947, 42 mines received aid from the government.

LA PAZ, BOLIVIA—The National Lead Company and the Corporacion Minera de Bolivia have agreed to terms for a six-month option to National Lead covering the important Matilde zinc-lead-silver mine.

CLEVELAND, OHIO—Oglebay Norton Company has entered the Canadian iron industry by securing 81 claims in the Lake St. Joseph area of northwestern Ontario from Lun-Echo Gold Mines, Ltd. Diamond drilling is planned for the property.

SALT LAKE CITY, UTAH—Kennecott Copper Corporation—world's largest copper producer—increased sales in 1957 to 552,945 tons. An increase of 57,226 over 1956. United States output of Kennecott for 1958 has been projected at 340,000 tons.

PARANARIMBO, SURINAM—The government of Surinam and the Aluminum Company of America have signed final contracts for the Brokopondo dam and power plant to generate electricity for a 60,000-annual-ton aluminum smelter.

CARLSBAD, NEW MEXICO—The International Minerals & Chemical Corporation has hoisted the 40,000,000th ton of potash ore from the company's No. 1 mine. Just over 30,000,000 tons has been sylvite and the rest langbeinite.

SAN FRANCISCO, CALIFORNIA—Production of steel in the United States in 1957 was the third highest in history—112,707,711 net ingot tons. All-time high was 117,000,000 tons in 1955.

WINTERING LAKE, CANADA—Rio Canadian Exploration is diamond drilling a series of anomalies in the search for nickel 35 south of International Nickel Company's Moak Lake-Thompson deposits. Anomalies were outlined by aerial magnetometer and electromagnetic surveys.

SALISBURY, SOUTHERN RHODESIA—Emeralds have been discovered on the Belingwe Native Reserve. To prevent a rush to the area the government has reserved the area and banned the sales of these gems.

SANTIAGO, CHILE—The Chilean Copper Department and large producers have agreed to a 10 percent cut in output on 1956 production rate. This would be based on the 442,400 metric tons produced by three large mines.

JAKARTA, INDONESIA—Tin production for 1957 was 27,725 tons—a decline from 30,053 in 1956.

CLEVELAND, OHIO—The Hanna Coal & Ore Corporation has negotiated an option to secure a substantial interest in Brazil's largest gold producer—St. John d'el Rey Mining Company. St. John also controls substantial reserves of iron ore.

ELIZABETHVILLE, BELGIAN CONGO—Copper output of Union Minière du Haut Katanga declined slightly to 240,000 metric tons in 1957. Union Minière will follow Chile's lead in cutting output 10 percent.

KIMBERLEY, NEVADA—Kennecott Copper Corporation has purchased the mines, equipment, buildings, and all White Pine County assets of Consolidated Coppermines Corporation. The Nevada Mines Division of Kennecott will operate CCC's mines which have been mining and shipping 9,000 tons of ore daily to Kennecott.

BEAUCEVILLE, QUEBEC, CANADA—An extensive claim-staking rush and placer gold sampling campaign is underway in the Chaudiere River valley just north of the United States boundary. Beaceu Placer Mining Ltd. controls over 100,000 acres. Test drilling has indicated dredgable values to depths of nearly 100 feet.

Anaconda and San Manuel Discuss Joint Project

Anaconda Company engineers have been investigating the possibility of entering into an agreement with the San Manuel Copper Company for the cooperative development of property owned by Anaconda adjacent to and northeast of San Manuel's ore body in Pinal County, Arizona.

Anaconda holds a wedge-shaped property near the Tiger mine and on the old route 77 between Oracle and Mammoth. This property adjoins that of San Manuel and is located to the northeast of the ore body now being worked. Earlier published descriptions of the San Manuel ore body revealed that it covered an area more that a mile long and one-half mile wide, with the portion of the body considered economically feasible to mine in the more northerly direction.

Large Iron Ore Reserves Indicated in Liberia

The Liberian-American-Swedish Minerals Company's $150,000,000 development program in Liberia is making progress. An extensive drilling program has been completed, together with some tunnelling, and results are reported to be excellent.

A reserve of 200,000,000 tons of iron ore, with an average grade of 65.5 percent Fe has been established in the main ore body at Nimba, about 250 miles north of the coast. In addition, there are approximately 39,000,000 tons of probable ore in the main ore body. In the same region, but apart from the main ore body, it appears from preliminary drilling and trenching that substantial reserves are available at South Nimba and at Mount Gbahm.

At Bassa, diamond drilling results have indicated reserves of iron ore amounting to between 30,000,000 and 60,000,000 tons. An exploratory tunnel being driven to determine whether the iron ore is of sufficiently good quality to warrant development is almost completed. Bassa has certain advantages for being mined first, among them: it is only 25 miles from the coast and 45 miles from a proposed harbor at Lower Buchanan; it is also on the proposed rail line. A temporary harbor could be constructed from which it would be possible to ship ore from Bassa during the period that the railroad is being built to the main site at Nimba, and while the permanent port at Lower Buchanan is being completed.

LAMCO is joint venture managed by the Swedish firm of Grangesberg A.B. Other participants are the Liberian government, International African-American Corporation, Atlas Copco, Nordstroms Linbanor, Svenska Entreprenad A.B., Skanska Cement A.B., and Ifoverken.

In April: Spectacular Rise of Lucky Friday in Coeur d'Alenes

BORAX ORE is hauled to plant by Kenworth trucks loaded by 3-yd. Bucyrus Erie 54-B shovels powered electrically.

RIPPING AND SCRAPER LOADING took overburden to a depth of about 137 feet where the world's largest known sodium borate ore body was exposed. Trucks haul the ore from the pit to crushing plant near stacker conveyor at upper top edge of

20 Mule Team Milestone

New Borax Open Pit Swings Into Peak

By STANLEY DAYTON
Associate Editor

Six months of continuous borax ore production from United States Borax & Chemical Corporation's new open pit mine at Boron, California has developed some interesting facts.

For instance, experimentation with blasting practice indicates that a new type 400-grain primacord, taped in 1-foot lengths to conventional 50-grain primacord, boosts the velocity of fertilizer grade ammonium nitrate.

Drill footages have exceeded expectations. A two-man crew using a Diesel-powered McCarthy auger drill with a 4¾-inch bit commonly bore 800 to 1,000 feet of blast hole per shift. Recently, with changes in type of steel and bit, the average is closer to 1,000 feet per drill shift.

Studies, in cooperation with the United States Bureau of Mines and using the USBM high-speed motion picture camera (capable of 1,500 frames per second), show that borax exhibits some peculiar breaking characteristics. Contrary to what a hard-rock miner might expect, borax ore more nearly approaches granite in resistance to breakage. Where one might expect satisfactory results with extremely low velocity detonations, such has not been the case.

Why Project Undertaken

U. S. Borax & Chemical developed the open pit on the Kramer deposit, world's largest known sodium borate ore body, to replace highly efficient underground mining. The new mine represented a $2,000,000 portion of a planned $20,000,000 program to modernize, expand, and centralize mining and treatment facilities at Boron. A new refinery costing $18,000,000 was constructed by Southwestern Engineering Company and Ford J. Twaits Company.

Though the overburden was 137 feet thick at the point where the pit was developed and depth to ore increases to the east in the direction of mining, several factors outweighed this consideration and justified execution of the project. Perhaps foremost among these was the opportunity to recover virtually 100 percent of the ore from an open pit. Underground mining using continuous mining machines, shuttlecar and belt conveyor transportation gave low costs, but pillars of ore were required for support of the back.

Also figuring in the decision to open-pit was the availability of better earthmoving equipment, making it possible to handle greater tonnages of waste. An open-pit mine had been considered 12 years ago, but the idea was temporarily discarded because equipment on the market at that time didn't make the project look attractive.

Over the past half century, demand for borax has doubled every 10 years. Now when we stand on the threshold of the rocket age, borax derivatives appear to offer exciting and potential use in rocket propellents. Other new uses are expected to swell demand. The open pit and new refinery expand producing capacity by 30 percent over former facilities, and will permit future expansion as it is warranted.

What The Ore Is Like

The ore is composed predominantly of beds of high purity sodium borate in the form of the mineral tincal ($Na_2B_4O_7 \cdot 10H_2O$) and smaller masses of kernite ($Na_2B_4O_7 \cdot 4H_2O$). It lies in a basin of deposition and is surrounded by a shale envelope. The deposit contains interbedded seams and lenses of low-grade, borax-bearing shale. Isolated masses of colemanite ($Ca_2B_6O_{11} \cdot 5H_2O$) and ulexite

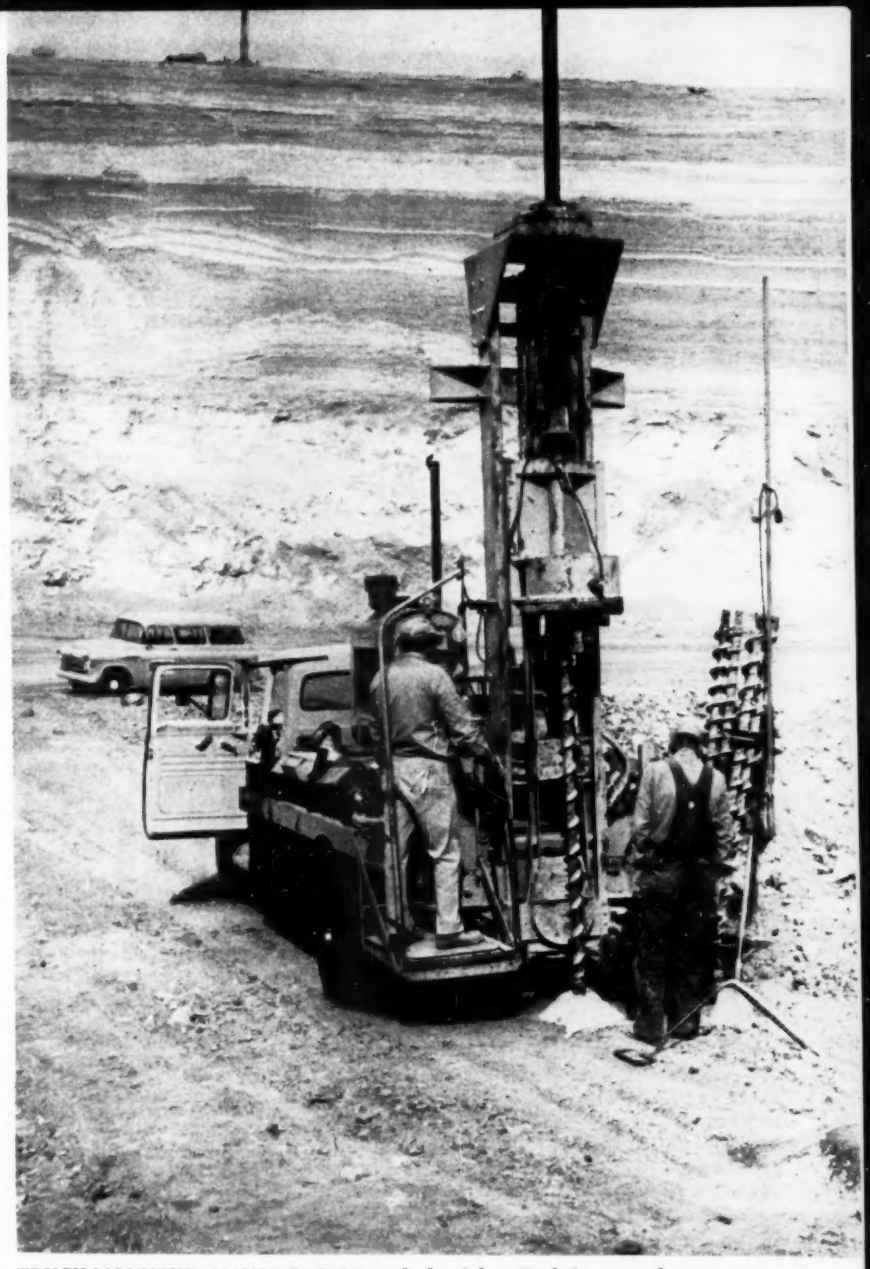
pit perimeter. Coarse crusher will be moved to bottom of pit eventually and conveyors will deliver ore to stacker.

Production

($NaCaB_5O_9 \cdot 8H_2O$) are also found but are of secondary importance in occurrence. Also treatment of the calcium borates is more involved and they are not so highly desired as the sodium borates. Origin of the deposit has been debated; some say it is of magmatic origin and others say it is the result of evaporation of brines.

The beds for the most part are massive and crystalline. The orebody occupies a belt which has been estimated to be ½ mile wide and up to 2 miles long. The deposit is contained in a synclinal structure but dips are gentle to the east and south. Overburden consists of alluvium and shale and is 137 feet deep at the present pit limits. It thickens to the east to 700 feet deep. Hoyt S. Gale estimated reserves at over 90,000,000 tons. According to U. S. Borax & Chemical president James Gerstley, reserves are sufficient to keep the operation going for more than 100 years at the present rate of production.

Selective underground mining yielded borax which was 70 percent pure or 28 per cent B_2O_3. The ore recovered by open-pit mining contains about 25 percent B_2O_3 due to the inclusion of some low-grade shale bands. Last year U. S. Borax & Chemical produced 800,000 tons of ore at a daily rate of 3,000 tons.



TRUCK-MOUNTED AUGER DRILLS made by Salem Tool Company have proven very successful for boring blast holes. Holes are put down on a staggered pattern measuring 12-by 16 feet; footage averages close to 1,000 feet per drill shift.

How Pit Developed

Here is the timetable for the new development. In January 1956 Isbell Construction Company started work on a 10,000,000-ton stripping contract to expose the ore at the western extremity of the deposit. Using heavy duty scrapers which were push loaded, overburden consisting of alluvial gravel, tuffaceous sandstone, conglomerate and shale, was stripped at a 500,000-ton-per-month rate.

Early in May 1957 ore was first exposed at a depth of 137 feet below the flat desert surface. U. S. Borax & Chemical began company mining activities almost immediately.

In November 1957 the new refinery, constructed as a joint venture by Southwestern Engineering Company and Ford J. Twaits Company, was formally dedicated. Late in the same month Isbell completed the initial 10,000,000-ton stripping project. At that time the pit measured 1,400 feet in diameter at the perimeter. Company mining had taken the depth to 175 feet below the surface or 38 feet

McCARTHY DRILL uses auger steel 4 inches in diameter; spacing between flights is 4 inches. Steel is in 6-foot sections. The bit is 4⅝ inches in diameter and contains 5 replaceable tungsten carbide cutting teeth.

below the level where Isbell first exposed the orebody.

Early in December 1957, U. S. Borax & Chemical took over stripping activities to extend the open pit limits to the north, following delivery of eight Euclid S-24 heavy duty scrapers and four Caterpillar D-9 tractors. Two of the D-9's are equipped with powerful Ateco hydraulic rippers and two with bulldozer blades—the latter for push loading and other miscellaneous work. The tractors for the Euclid S-24 scrapers are equipped with Cummins, turbo-charged, 335-horsepower engines, torque converters and 4-speed torqmatic transmissions. The payload capacity is 24-yards struck.

The overall slope of the pit is 1.4 to 1. Benches in waste are at 50-foot intervals. The slope of benches in alluvium is ½ to 1 and in shale 0.75 to 1. In ore the benches are to be 25 to 30 feet high. The exact spacing will be determined following further experience with drilling and blasting characteristics of the ore. Haul roads in the pit are a minimum of 40 feet wide. The maximum grade of the access road is 7 percent. Along the major proportion of the distance it is only 6 percent. Design of the pit was under the direction of W. H. Wamsley, acting general superintendent, and Robert E. Kendall, mine engineer.

Drilling

Vertical holes are drilled using truck-mounted McCarthy auger drills (Salem Tool Company). Two of these machines are on hand; both are powered by Hercules Diesel engines, but one, the model 106-24, is equipped with a two-speed gear box and augers holes up to 24 inches in diameter. The second McCarthy rig, model 106-8, is capable of augering holes up to 8 inches in diameter. The steel is in 6-foot-long sections and is 4½ inches in diameter (outside diameter to edge of flights). One end of the auger steel contains a male fitting and the opposite end a female fitting. Both ends are tapped with a hole. Sections are joined by fitting the female end over the male end and inserting a pin through the mated holes of the coupling. Various types of McCarthy auger steel have been tried. The one which has given most success to date is the 4½-inch-diameter steel with a pitch that leaves a 6-inch spacing between adjacent auger flights. A relationship exists between the diameter and pitch of the auger. Earlier some difficulty had been experienced in clearing cuttings from the hole while using a 4½-inch-diameter steel with a 4-inch flight spacing. With 4½-inch steel, a 4⅝-inch bit is used and it contains 5 tungsten carbide, replaceable cutting teeth.

Multiple rows of blast holes are drilled on a 12- by 16-foot staggered pattern. The holes in each row are on 16-foot centers with a 12-foot spacing between rows. Penetration rates have been very high. In one instance a penetration speed of 15 feet per minute was attained. Holes are drilled 5 feet below grade.

Blasting

Most of the rock breakage has been done by using a 10-pound cartridge of Hercules EP 203 powder placed at bench grade and prilled fertilizer-grade ammonium nitrate treated with Diesel oil. The powder factor has amounted to about ½-pound per ton of ore broken. The powder charge is detonated by using fuse and primacord with delay connectors between adjacent rows of holes. Electrical firing has been ruled out because of the large number of planes equipped with powerful radar operating from nearby Edwards Air Force Base.

As mentioned at the start of the article, a great deal of study has been directed toward the blasting problem. Tests using 400-grain primacord taped in 1-foot lengths and spaced 3 feet apart along the 50-grain primacord have given good results while eliminating the need for a primer. The theory behind this practice is that the heavier primacord increases the velocity of detonation of the powder column. It has been stated by one manufacturer that the low velocity of ammonium nitrate (10,000 feet per second) approaches more closely the speed of conventional primacord (20,000 feet per second) in this manner. The net result is a velocity of 12,000 to 13,000 feet per second. The primary disadvantage of this method is that the 400 grain primacord is a little over 5 times as expensive as the regular 50 grain variety. At that, the total cost would be competitive to the primer and there would be added incentive of faster detonation. The heavy primacord method is expected to replace the older practice of priming blast holes.

New Blasting Theory

In cooperation with the company, the United States Bureau of Mines has conducted extensive tests of the breaking characteristics of the ore. They were carried out by firing test shots, by observing regular production blasts, and were aided by the high speed motion picture camera mentioned earlier. The preliminary results tend to support a new theory of rock breakage by explosives. This theory was developed by the Bureau of Mines and is described in RI 5356, Rock Breakage by Explosives, by Wilbur I. Duvall and Thomas C. Atchison.

The authors of this report state that the detonation of an explosive charge in a blast-hole creates a high gas

pressure in the hole, which in turn generates a compressive strain pulse in the surrounding rock. This compressive strain pulse travels outward in all directions from the charge hole. Near the charge hole the amplitude of this strain pulse is sufficient to cause crushing of the rock. As the strain pulse travels outward its amplitude decays rapidly until no further crushing of the rock is possible. The compressive strain pulse continues to travel outward until it is reflected by a free face. Upon reflection the compressive strain pulse becomes a tensile strain pulse. As the strength of rock in tension is much less than in compression, the reflected tensile strain pulse is able to break the rock in tension, progressing from the free face back toward the shot point. In other words, the rock is pulled apart, not pushed apart.

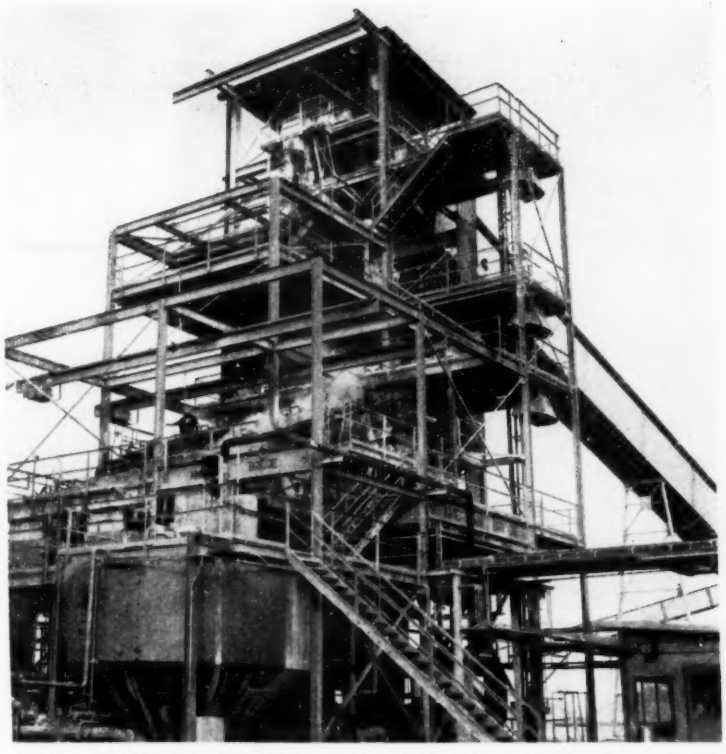
A popular concept of rock breakage in the past has been that the expanding gases produced by the explosive have pushed the rock from the blasthole to a free face. Look for further improvement in blasting at U. S. Borax & Chemical's new open-pit mine as the result of continuing studies.

Loading & Hauling

The mine has been equipped with two Bucyrus Erie 54-B shovels which are powered electrically. The power is carried to the shovel at 4,160 volts. Though the above shovel model is usually fitted with a 2½-yard bucket, the light and nonabrasive nature of borax permitted the installation of 3-yard bucket. Two shovel shifts per day can normally stay ahead of the anticipated daily output.

The haulage fleet is composed of 12 Kenworth model 802, rear-dump trucks. During a normal cycle four trucks will handle the output of each shovel. The Kenworths are capable of hauling 22- to 24-ton loads to the crusher located 0.8 miles from the pit at the plant stockpile area. As operations progress, the crusher will be moved into the open pit and ore will be transferred to the plant by belt conveyor. The Kenworths are equipped with Cummins, 300-horsepower, turbo-charged engines, Allison torque converters, Allison torqmatic transmissions, and tubeless tires.

Investigations are constantly underway with regard to the stripping problem and quite likely some rather new material handlings techniques will be applied. The engineering aspects of the open pit operation have been well planned, and it is certain that U. S. Borax will contribute a great deal to our present knowledge of drilling, blasting, and earth moving.



ABOVE DISSOLVER SECTION contains 4 steel tanks equipped with steam coils, steam jackets and mechanical agitators; feed is ¾-inch ore, return plant liquor and make-up water; Effluent is screened on Tyler Hummer units.

Refinery Design Provides Safety-Valve For Growth

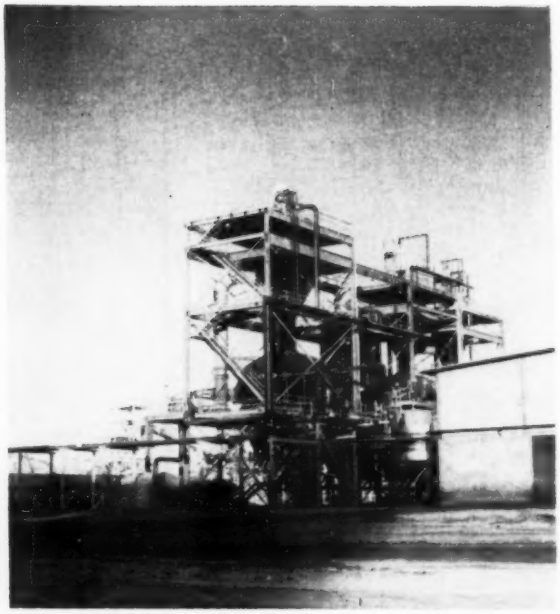
Chemical treatment of borax ore has bridged the gap between concentration and refining at United States Borax & Chemical Corporation's sprawling new plant at Boron, California. The new $18,000,000 refinery, built by Southwestern Engineering Company and Ford J. Twaits, was formally dedicated November 13, 1957, thereby centralizing most of the ore-to-product capacity at the mine site near Boron.

Before the new plant went onstream, borax was concentrated by gravity and by magnetic means at the mine. The concentrate was shipped 209 miles to Wilmington, California where it was further refined into customer products. With the completion of the new refinery, the Wilmington facilities will be largely confined to producing boric acid.

Growing consumption of borax the past few years imposed demands for additional capacity on United States Borax & Chemical and gradually accelerated obsolescence of the former ore treatment installations. The new refinery was conceived as part of a plan to modernize and provide a safety valve for future expansion. Certain portions of the new refinery were over-designed or over-built so that additional capacity could be obtained with a minimum of expense and time.

The new processing installation was built as separate units, some housed under a roof and some in the open. A wide variety of automatic controls have already been installed and more will be added when further experience is gained. Nearly saturated solutions are handled through much of the plant circuit, and this condition imposes precise and critical control at a number of points. Of interest to beneficiation men are the four thickeners at Boron. They are the largest totally

INSULATED THICKENERS are thought to be world's largest enclosed units; rake mechanisms were furnished by Process Engineers, Inc; feed is screen undersize from dissolvers.



VACUUM CRYSTALLIZERS at left of building are fed with filtered overflow of CCD thickeners; borax crystals are then separated from solution by Sharples automatic centrifugals.

enclosed and insulated units ever made. The rake mechanisms for the thickeners were supplied by Process Engineers, Inc.

The process involves crushing, dissolution, vacuum crystallization and drying to produce 5 and 10 mol borax. A portion of the product from the granulation plant is used to make anyhdrous borax in a separate section of the refinery.

Crushing and Stockpiling

Crude borax from the open pit is delivered by trucks to a dump bin ahead of a 42- by 66-inch Jeffrey Flextooth hammer mill where it is crushed to 4 inches. This product is delivered to a 42-inch-wide, Stephens-Adamson conveyor which is connected through conveyor take-ups to a Hewitt Robins stacker. The stacker consists of a bridge which travels a 730-foot-long set of tracks and a fixed, cantilevered conveyor boom extending from the bridge at right angles to the track and feed belt. The 42-inch-wide belt on the Hewitt Robins stacker distributes the crushed ore to a stockpile in layers for blending to a uniform grade. The tip of the conveyor boom is 45 feet above the ground. The stockpile, when filled, measures 730 feet long, just under 45 feet high, and is approximately 112 feet wide at the base. It has a total storage capacity of 60,000 tons, but the live load which can be withdrawn from the stockpile is 20,000 tons.

A reclaiming tunnel below the stockpile, containing a 30-inch wide conveyor, is fed by 16 drawpoints. The tunnel is lined with 10-foot-diameter, circular, corrugated, steel tubing and is 800 feet long. The conveyor in this tunnel delivers the ore to the secondary crushing plant. Here it is reduced to ¾-inch size by a Jeffrey impactor type, Flextooth crusher in closed circuit with two vibrating screens having ¾-inch square mesh openings. The secondary crusher is powered by a 300-horsepower motor. There is an automatic sampling system in the secondary crushing circuit which cuts samples for analysis.

Dissolver Section

The minus-¾-inch ore is then distributed to four elevated, conical-bottom, steel bins, each having 1,000 tons storage capacity. A fifth tank of identical size in this group is used to store soda ash. This product is fed to the ore in predetermined amounts as necessary to replace the calcium content of the feed with sodium when the ore is dissolved. Soda ash also helps prevent lime deposits in the dissolvers and pipe lines. All five bins discharge to a common belt conveyor. The draw rate from each of the crushed ore storage bins is regulated according to ore analysis and production requirements.

A belt conveyor delivers the crushed ore to the top of the dissolver section. At this point, the ore is mixed with return liquor from various points in the plant and make-up water. Dissolution takes place in a series of four, steel, mechanically agitated tanks containing steam coils and a steam jacket. The borax content goes into solution while the shale and other gangue remain in suspension. The capacity of each dissolver vessel is approximately 2,000 gallons. The pregnant slurry discharged from the dissolver section is passed over four Tyler Hummer screens fitted with stainless-steel 100 mesh decks to remove coarse solids.

Counter Current Washing

The fine solids in the suspension are removed by the four, 230-foot-diameter, counter current thickeners mentioned earlier in the report. These thickeners are 8 feet high at the periphery. The thickener underflow advances to waste through thickeners number 1 to 4. The final underflow is pulped with the coarse reject from the Tyler screens and pumped to the tailing pond by a battery of six Barrett Haentjens Hazelton pumps. Fresh water is introduced at the last thickener to wash the sands. The over-

WYSSMONT TURBO-DRYERS remove surface moisture from borax crystals recovered by centrifuging. Dryers consist of series of horizontal revolving trays which are fed at top.

STORAGE BINS hold minus ¾-inch ore and soda ash. Conveyor leads to dissolver section. The plant was built by Southwestern Engineering Company and Ford J. Twaitts.

flow of thickeners number 1 and 2 advance to filters and then to vacuum crystallizers.

Each of the thickeners has a capacity of 3,000,000 gallons of pregnant pulp and the settling area measures 40,000 square feet. The bottom of each tank is lined with ¼-inch steel plate. The sides and roof contain ⅜-inch steel plate. The totally enclosed thickeners are insulated with a layer of asbestos concrete to keep the solution at elevated temperatures as high as 200° F. External ambient temperature varies from 30° F. to 110° F.

The roof of each thickener is suspended from a series of trusses which radiate from a concrete column at the center of the tank to channel iron columns supported on concrete footings at the edge of tank. The concrete column at the center of the thickener also supports the rake and drive mechanisms.

Granulation Plant

In the granulation plant, pregnant borax solutions, some nearly saturated, are crystallized and dried. There are actually three different units in this section of the refinery. Two make refined 5 mol and 10 mol borax. The third makes a crude borax concentrate. To make refined borax, the solution must first be filtered. This is done in an installation composed of six Sweetland filters after which the solution is pumped to the crystallizers.

There are four vacuum crystallizers which cool and super-saturate the borax solutions. Each crystallizer serves one unit of the granulation plant and the fourth is a spare which may be put in the circuit in place of any one of the other three. Two crystallizers are fed with filtered solution and the third is fed with unfiltered solution. Evaporation of solution under vacuum in each crystallizer causes formation of crystals which grow by circulation inside the unit until large enough to settle to the bottom. Borax crystals pumped from the above units are separated from solution by Sharples automatic centrifugals. There are a total of 16 Sharples classifiers for reclaiming crystallized borax from solution. After centrifuging, the various borax products are fed to Wyssmont turbo-dryers to remove surface moisture. These dryers are steam heated and consist of a series of horizontal revolving trays. Feed enters at the top and the solids are raked across the tray to be discharged to one directly below it.

The dried borax is transported to a series of nine storage silos and to an angle of repose building which provides bulk storage. Each of the nine storage silos are 100 feet high and approximately 35 feet wide. They are made of reinforced concrete, and each has a capacity of about 2,000 tons. Six of the silos store Rasorite 46 and three store 5 mol refined borax.

Anhydrous Plant

In a separate plant, anhydrous borax is made from refined borax. This is done by first drying and preheating refined feed from the granulation plant in four rotary dryers operating in parallel. The discharge from each dryer is fused in four gas-fired furnaces to produce molten borax. The molten borax from each furnace is continuously fed in a small stream to a water cooled revolving roll below each furnace. Here the borax is chilled and solidifies into a thin glass-like layer as it spreads across the face of the roll. The borax is taken from the rolls in continuous sheets and transported by shaking conveyor where it is further cooled by an airstream blowing across the conveyor. This product is crushed, screened, and stored in a series of three storage silos identical in size and capacity to those in the granulation plant.

The entire plant spreads out over 80 acres adjacent to the open-pit mine. It is expected that a high degree of automation will be attained in the new plant. THE END

Manager's

THE CAMERA is a tool frequently used by industrial engineers at Chino Division of Kennecott Copper Corporation to study on-the-job situations. Don Schmidt of the mine industrial engineering office focuses while Bill May, track foreman, watches.

SANTA RITA OPEN PIT is one branch of the Chino Mines Division which also includes a concentrator, smelter and a fire refinery. Next to Utah Copper, the Santa Rita open pit is probably Kennecott's second best producer.

Kennecott Copper Corporation has scored a first in western mining circles by fully integrating industrial engineering departments into the organization of its four mining divisions—Chino Mines, Ray Mines, Nevada Mines, and Utah Copper. In brief the industrial engineering departments are management's fact-finding and fact-analysis branch.

How many times have you encountered problems similar to the following? Are you getting maximum productivity from your equipment, machines and employees? How efficient is the operation? Are you getting excellent penetration rates with a new rotary, blast-hole drill only to have down-time and delays cut footage per drill shift? Though an efficient truck or train haulage cycle may exist at an open pit, would conveyor belts or inclined skip hoisting cut costs? What about automatic control of tonnage to a ball mill? Would it be practical or feasible at your operation? A manufacturer develops a new flexible coupling for a crusher drive-line. Is it worth testing? Can the purchase be justified in terms of cost, reduced maintenance, increased safety, and efficiency? Have engineered standards been established which serve as a yardstick for comparing periodic performance reports? Should the old bulldozer be scrapped and a new one purchased to replace it

These are every day problems in mining and every firm in the business has its share. But how many times are the actual decisions based on data which was gathered impartially and evaluated scientifically? More often than not, supervisors and management are far too busy to examine completely these and other possible cost saving methods. And opinions often are formed on the basis of judgement alone.

Scientific Management

Recognizing the complexity of management today, Kennecott organized industrial engineering departments late in 1953 to provide trained personnel who have full-time responsibility for making those studies and analyses which all levels of management would like to make for themselves if

Fact-Finding Department at Kennecott

they had sufficient time. Probably the most misunderstood of all engineering practices, industrial engineering involves far more than time-motion surveys. In most instances, the industrial engineer serves in an advisory capacity to management, and designs systems for obtaining maximum utilization of the resources of an organization. At Chino Mines Division, Hurley, New Mexico, experience following establishment of a department of industrial engineering has been a happy one. Progress has been made on waste dump methods, control of dust on open pit road, drilling methods, replacement of equipment and in many other directions.

What Is Studied

Currently industrial engineering studies are proceeding along some of the following lines at Chino Mines Division:

1. Haulage costs and size of trucks. This involves compiling data regarding cost of ore and waste haulage and determination of most advantageous truck size.

2. Track and dump methods include several studies to improve track shifting, to improve methods for dumping and spreading waste, and to simplify installation and track maintenance.

3. Investigations of comparative specifications and performances of different sizes of bulldozers and shovels.

4. Determination of best types of lubricants for machinery.

5. Studies to improve the handling of blister copper cakes.

6. Studies to improve the mill clean-up systems.

7. Development of engineered standards to provide management and supervisors with yardsticks against which to measure current labor, maintenance, and supply costs.

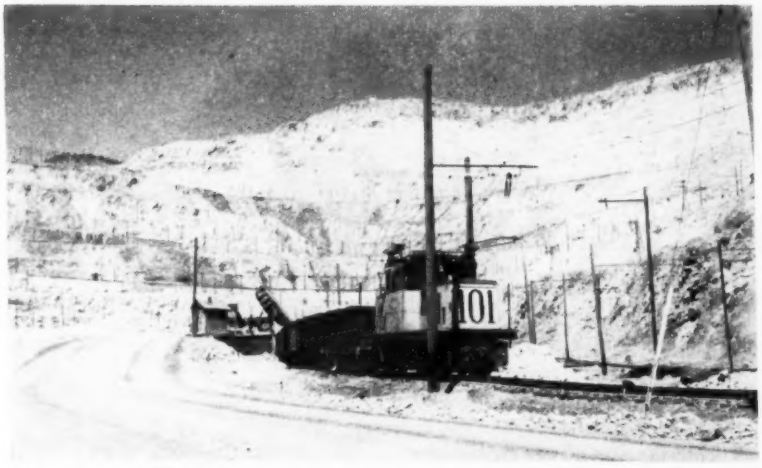
Organization

The industrial engineering department is organized along the following lines. The division industrial engineer is responsible to the general manager of the Chino Mines Division. Under him are three plant industrial engineers (mine industrial engineer, concentrator industrial engineer, and smelter industrial engineer). Each of these industrial engineers has one or more assistant industrial engineers.

The industrial engineering department is a service organization for the entire division. A request for study of a specific project may be originated by any supervisor or department head. The request must be approved by the mine, mill, or smelter superintendent having jurisdiction. When a project receives approval for active study, the industrial engineers examine the problem, gather the facts and submit a detailed report. Recommendations for action based on results obtained during the examination are always included in the report. However, the industrial engineering department is not empowered to make decisions based on the findings. This is the responsibility of management. But industrial engineering departments may be called upon to help supervisors put into action a recommended change.

Industrial engineering departments at Kennecott's other divisions (Utah Copper, Nevada Mines, Ray Mines) operate along similar lines. The activities of the industrial engineering departments at the four western divisions are coordinated by a western mining divisions chief industrial engineer at Salt Lake City, Utah, who acts in an advisory position only. The division industrial engineer reports only to the division general manager. The chief industrial engineer and division industrial engineers meet at intervals to exchange ideas and advice. An idea developed at Ray Mines, Nevada Mines, or Utah Copper might be just as applicable at Chino. The over-all objective and purpose of the industrial engineering service is to provide more scientific management of operations.

To get down to specifics the following are some of the activities in which



HAULAGE FROM SANTA RITA OPEN PIT is done largely by railroad. The industrial engineering department at Chino has engaged in track studies at the suggestion of the mining department. Purpose is to mechanize track-laying and maintenance.

What Is Industrial Engineering?

The American Institute of Industrial Engineering defines this question as follows: "Industrial engineering is concerned with the design, improvement and installation of integrated systems of men, materials, and equipment. It draws upon specialized knowledge and skills in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to set standards, estimate, and evaluate the results to be obtained from such systems."

HANDLING BLISTER COPPER was on the agenda for study. Shown above are Charles Lockart, industrial engineer (left), and Wesley Dow, assistant smelter superintendent.

HEADING the industrial engineering department at Chino since its starts is Joseph J. Brubaker.

the Chino industrial engineering department is expected to engage:

1. Methods improvement.
2. Development of performance and cost standards.
3. Development of cost-control systems.
4. Consultation with appropriate supervisors on equipment replacement.
5. Assist as requested with preparation and justification of requests for authorization for expenditures.
6. Development of standard procedures.
7. Design of functional layouts.
8. Preparation of job and position descriptions.
9. Classification and evaluation of jobs and positions.
10. Analysis and design of division organization for management.
11. Other special studies.

Methods Improvement

The primary objective is to develop the best and safest method of carrying out each operation at the least cost. Working with operating supervisors, industrial engineers at Chino analyze current processes using time-tested methods and tools.

For instance the industrial engineering department, at the suggestion of people in the mining department, has engaged in track studies of the railroad at the Chino open pit. As a result of these studies, purchases were made of a power ballaster, power jack, and a power spiker with which to mechanize track-laying and maintenance. Waste hauled to the dump in side-dumping, 7-car trains is now bladed to the edge of the dump by a heavy-duty rubber-tire-mounted tractor. Frequency of track shifting on waste dumps has been materially reduced by lengthening the distance of shifts from 6 feet to about 60 feet. Savings by the bulldozer method of handling waste on the dumps is estimated to be over 50 percent. This is not normal operations but a new method that is being tried. Present information is not conclusive at this time.

Work is still going forward on waste handling and track handling methods on waste dumps and further economies may be effected. One point brought out is that a need exists for a device which will quickly angle a bulldozer blade both left and right. It is felt that such a device would materially contribute to the success of disposing of waste with a bulldozer. The foregoing results were based on a cooperative analytical study suggested by the general mine foreman at the Santa Rita open pit and carried out by industrial engineers and mine operators.

In another similar sort of study illustrating methods improvement undertaken by the industrial engineering department, dust control measures in the open pit have been improved. It has been found that the use of lignon sulphonate (a byproduct of the paper industry) as a roadbinder, may save up to 550 water-truck, sprinkling-shifts per year. In addition the use of this product on the mine roads drastically reduces dust wakes created by vehicles while saving up to 11,000,000 gallons of water each year. Sulphite treated roads are smoother, firmer, and do not present a freezing hazard in the winter. These latter advantages could conceivably result in reduced tire wear, and also decreased engine and chassis maintenance due to a reduction in dust. It has been estimated that approximately twice the road mileage can be treated with sulphite waste with a $6,000 annual saving.

Development of Standards

Work in this category at Chino has been somewhat limited due to the heavy back-log of projects which was put on the agenda when the department was established. Briefly performance and cost standards will fall into three divisions involving (1) labor force control, (2) maintenance control, and (3) production supply control. Taking each one separately, a system of engineered standards, serving as a yardstick, is to be developed for labor, maintenance and supplies. This will make it possible for supervisors to determine how well actual performance of labor and maintenance, and use of supplies compares with the engineered standards during a given period. Periodic reports will be issued to each supervisor showing those costs and performances for which he is responsible. With these reports on hand, each supervisor will have a complete picture of the costs which he himself can control. Of course, the initial engineered standards which are installed will be subject to later change based on operating experience. But once the over-all system is established and coordinated, management and supervisors will be able to determine quickly where the soft spots are in the operation and where an operation is falling down in performance. Excellent control of costs should result.

Equipment Replacement

Many times it is difficult for a supervisor to convince management that a piece of equipment should be replaced. Conversely, supervisors shouldn't expect management to authorize replacement without supporting data justifying the change. This is a situation made to order for the in-

dustrial engineering department. This branch of each division is expected to make economic and performance studies and also consider safety and other factors in analyzing equipment-replacement needs.

Where a supervisor requests the department to make a study of any particular equipment needs, the report submitted by the industrial engineers is far more detailed, and if favorable, provides a more forceful request than the supervisor himself would have time to compile.

The industrial engineering department, working with appropriate supervisors, has studied replacement needs for a variety of items. Examples include: the replacement versus repair of fork lift trucks on the copper floor of the smelter; the question of whether or not the replacement of a 6-ton overhead crane in the machine shop is justified; whether the purchase of a front-end loader for the Santa Rita operation is justified; whether an old surfacer in the carpenter shop should be rebuilt or scrapped and replaced; studies for the mine department to determine whether some of the older bulldozers should be replaced and if so with what size and type of machine.

Purchases of equipment and services involving expenditure of funds over a limiting amount can be obtained only on approval of an authorization for expenditure (AFE) request. The industrial engineering department is charged with the final preparation of all AFE's. Though an industrial engineering study is not required in order to submit an AFE request, frequently one is requested to define and support it. Assistance in preparing AFE's closely parallels the foregoing description of consultation on equipment replacement. It is true that whenever funds are requested from management for any purpose, the initiator should be able to justify the request. And what better way is there than through an industrial engineering study?

Assistance to Management

The foregoing discussion shows how the industrial engineering department cooperates with the operating side of the mine organization. There are also certain very definite functions performed by the department for administrative and management personnel. These latter functions are numerous and too involved for description in this report. Examples include fact finding studies required for job classifications or evaluations, and studies dealing with the organizational structure of the division. A significant activity of the Chino Mines Division industrial engineering department, since its inception in late 1953, has been concerned with preparation of organization charts. An extensive salary survey has been completed for the management. The findings were incorporated into a new plan for administering salaries and wages, under which each employee knows just how far he can expect to progress in salary scale within a given job or position.

Since the industrial engineers are expected to be familiar with operations in general, including production and accounting, they may be called on to do special studies. For instance the department may be asked to collaborate in establishing and maintaining incentive systems, or to study possible plant locations.

What Are the Results

Has the idea of industrial engineering worked? At Chino and other Kennecott Divisions the answer is yes. A definite dollars and cents price-tag can't be put on the value of the department simply because it is impossible to evaluate how many of the money saving ideas would have been generated normally if the department hadn't been created. Further time and results would be required to judge the monetary aspect. It can be said that the industrial engineering department at Chino has engaged in studies which ultimately saved more money than was required for its operating budget.

How do industrial engineers take to mining, milling, or smelting? According to Chino's department head—just fine. Of course, a brief period of orientation and training is required but this is necessary for anyone taking a new job, even in a field in which he has specialized.

Do mining engineers make good industrial engineers? Again the answer is yes. When the organization was established at Chino, key jobs were filled partly with Chino engineers from long-established departments and partly by hiring trained industrial engineers. The idea was to achieve a balance of talents which could be pooled to make the organization operate more smoothly. Mining engineers underwent a training period in methods and applications of industrial engineering.

Industrial engineering is not a cure-all for the ills now troubling the mining industry. With today's squeeze on profits, however, it is likely that the fundamental principles of industrial engineering will find wider application in the minerals field. THE END

EXAMINING a piece of equipment in the mill are Robert Ganley (left), an industrial engineer at Hurley and Tom Hill, industrial hygiene engineer.

SHOVEL DIPPER STICKS is the problem being discussed by Walter E. Fleming (left), assistant shovel repair foreman, and Don Cummings of the mine industrial engineering office.

Mr. Carl-Bertil Berglund is chief engineer of the Research and Development Department of Luossavaara-Kiirunavaara AB which operates Sweden's largest iron ore mine. This is also one of the largest mines in Europe and, when the program of conversion from open pit to underground mining is completed in 1962, it will produce 12,000,000 tons per year to become the world's largest underground iron mine and possibly the largest in point of tonnage. In 1956 10,400,000 tons were mined.

He was graduated from the Royal Institute, Stockholm, Sweden, as a mining engineer in 1949, and has been employed at Kiruna ever since. While this is his first trip to North America, he has visited many mine in Germany, France, Norway, and Finland, in addition to the Swedish mines.

As chief engineer, he is in charge of six sections: Research, Planning, Time studies, Standardization, Ventilation, and Safety. These sections employ 25 engineers and 20 time study men. Mr. Berglund considers the Planning section to be the most important. This is long-range planning which determines where to put a new shaft or how to develop an entire mine level. Time studies are most essential in this planning, he believes.

"Time studies are important when trying new methods to see how they will work."

How U.S. Mining Looks To Swedish Engineer

Q. What are you doing in the United States, Mr. Berglund?

A. I came to the United States to observe mining methods and machines used here. Also to visit important mines and steel plants. I was especially interested in seeing sintering plants for iron ore and determining what the trend for blast furnace feed is in the United States.

Q. You visited Canada on your way to the United States, didn't you?

A. Yes, I was fortunate to be able to participate in the Sixth Commonwealth Mining and Metallurgical Congress which gave me the opportunity to see many of Canada's most important mines and metallurgical plants. It was a wonderful experience.

Q. What types of machines did you want to see?

A. I wanted particularly to see how the mining industry uses the new electronic calculating machines and data processing equipment.

Q. Where did you see such equipment?

A. I found that the Oliver Iron Mining Division (U.S. Steel Corporation) uses it for payroll purposes. I have read in MINING WORLD how the Homestake Mining Company uses machines for determining costs.

Q. Why were you interested in these machines?

A. Such machines could be used at Kiruna; primarily for ore grading. This is a matter of a great interest because five grades of ore are mined. The price variation for the ore from A to D grade is 50 to 60 percent. It is hard to selectively mine each grade of ore. However, by the use of calculators for operational analysis, it should be possible to mine and process the ore so as to ship more higher grade.

Q. From what you have seen here do you think Kiruna will buy such a machine?

A. Yes, I think we will have to buy one sometime. Right now we must determine more about the problems and how a machine might help us solve them. I have already said that the best chance for use appears to be ore grading. The biggest problem at Kiruna is transportation—ore, men, and supplies. The machine might be able to help us solve transportation problems. In some respects, our entire underground mine can be thought of as a transportation problem, and we think we can improve present methods by careful analysis.

Q. What mining and metallurgical equipment made in the United States is already used in Sweden?

A. At Kiruna we use large Bucyrus-Erie electric shovels, Caterpillar tractors, Euclid trucks, and Joy drills in the open pit. Underground, we use Eimco loaders, Joy shuttle cars and loaders.

Q. Now this works both ways; what Swedish equipment have you seen in United States mines?

A. Coromant drill steel, Atlas Copco drills, Flyght pumps, and ASEA Koepe hoist. I might say that the Swedish beneficiation plants are way ahead of the United States in the use of rubber and that important savings can be made by its use. (A report on the use of rubber at Kiruna appears on page 49 of the January 1958 issue of MINING WORLD—Ed.)

Q. What mines and plants have you visited in the United States?

A. St. Joseph Lead Company's southeast Missouri operations; Jones and Laughlin Steel Corporation's Tracy mine, Negaunee, Michigan; the Eagle Mills, Mather B., and Cliffs Shaft of Cleveland-Cliffs Iron Company, Ishpeming, Michigan; Oliver Iron Mining Division's Soudan mine in Minnesota; Reserve Mining Company's Silver Bay taconite plant also in Minnesota; Climax Molybdenum Company, Climax, Colorado; Anaconda Company's Butte, Montana open-pit and underground mines; Bunker Hill Company in Idaho; Kaiser Steel Corporation's Fontana, California steel plant; and San Manuel Copper Corporation, San Manuel, Arizona.

I also visited Allis-Chalmers Manufacturing Com-

"The open pit mining was very impressive. The equipment is so big and so good . . . "

"The use of concrete for grouund support in block caving was fantastic."

pany, Dings Magnetic Separator Company, Nordberg Manufacturing Company, and Bucyrus-Erie Company in Milwaukee, Wisconsin; and the Joy Manufacturing Company's factories in Pennsylvania and Indiana.

Q. What new methods and new equipment did you see in United States mines?

A. Communication systems were of great interest; much better than in Swedish mines. The use of short wave radio sets on locomotives and the Telescriber used at Bunker Hill are examples. So was the underground Trolley Phone at Cleveland-Cliffs. The use of ammonium nitrate for blasting at Anaconda's Berkeley pit was the first I had seen.

I was really impressed by the crushing system at Silver Bay. It was designed so that it could easily be expanded rapidly. The machines were placed so that spare units could be installed easily. I also liked the use of instruments at Silver Bay for measuring and control. The magnetic ton principle was excellent.

Q. Can this type equipment be used at Kiruna?

A. Yes. The Kiruna plant must have more instrumentation. We must install measuring and control equipment in the mill. Underground, we will install central traffic control for ore haulage. During my trip to the United States, I expected to find a greater application of industrial television than I actually observed. The only instance that I can recall was a TV camera used to help monitor rail-car unloading from a central control tower.

Q. What mines and plants did you visit in Canada?

A. Mostly iron ore mines, but some others, too. These are the companies: Gunnar Mines Ltd., International Nickel Company of Canada Ltd., Algoma Ore Properties Ltd., Iron Ore Company of Canada, Sherritt Gordon Mines, Ltd., and Steep Rock Iron Mines Ltd.

Q. What did you think of Canadian mining?

A. Very good. I was very impressed by speed of mine development. It takes only a few years from muskeg to full production. Gunnar and Iron Ore Company of Canada (Knob Lake) are examples. The Canadian tax laws are well planned to encourage fast mine development.

Q. What about underground mining in Canada?

A. The use of concrete for ground support in block caving was fantastic. It was mixed on the surface and transported underground through pipes. I was shown that no reinforcing steel was used in underground concrete. This is a tremendous aid in repairing cracked and damaged structures. Maintenance consisted of patching after the damaged area had been chipped out.

Q. Can you give a comparison between Canadian mining and United States mining?

A. No, I can't give a direct comparison, but I will say that both Canadian and United States mines have very good ventilation. Fresh air blowing in every face. Also mines use heavy rails on main haulage. In many mines I visited, I saw 70-pound rail. On the surface you often load rail cars to 70 to 100 tons. In Sweden we are presently limited to 40 or 50 tons on railroad lines. We must improve our rail haulage along these lines in Sweden. I noticed the very effective contact between supervision and labor. Also the outlook on safety. Every man is very safety conscious. Safety helps, does not make the work more difficult. The open-pit mining was very impressive. The equipment is so big and so good that you can do much more stripping to get to the orebody. The equipment is dimensioned for high production.

Q. What proportion of mining costs is for labor in Sweden?

A. It has been about 50 percent, but is now rising to 55 to 60 percent. I understand it is 65 percent in the United States.

Q. Several times you have mentioned time studies. When did you start them at Kiruna?

A. In the early 1940's. I am surprised that you don't use them more often in the United States.

Q. How are time studies used at Kiruna?

A. To study and evaluate piece rate work to determine unit cost. Used both in mining and repair departments. Studies are important when trying new methods to see how they will work.

NEW LEAD-ZINC TARIFF PROPOSAL was made by Samuel Arentz, standing far right, at the lead-zinc session. Other session speakers included Ed Snyder, Combined Metals Reduction Co.; R. L. Ziegfeld, Lead Industries Assn.; D. W. Pettigrew, American Zinc Institute; Charles Schwab, Bunker Hill Co.; D. M. Kentro, Shattuck-Denn Mining Corp.; Charles Jordan, Buckskin Joe Mines; Douglas Watrous, Jack Pine Mining Co.; and Harvey Tedrow, Leadville Lead Corp.

Talk Centers on Minerals Policies During Colorado Mining Convention

A new lead-zinc tariff proposal; the announcement of the discovery of a 40,000,000-ton borax deposit in Southern California; an incentive program for all minerals proposed by a leading Congressman; the favorable prospects for early free market sales of uranium by miners; and a demand for governmental stockpiling of domestic uranium concentrates in the post-1962 period by a member of the Joint Congressional Committee on Atomic Energy, kept delegates on the edge of their chairs at the National Western Mining Conference in Denver, Colorado, February 6, 7, and 8.

While these topics drew greatest interest, more than 75 speakers took part in the program sponsored by the Colorado Mining Association. Here and there one could detect signs of optimism. A major drill contractor reported that his business potential for 1958 was expected to equal and probably surpass 1957 volume. Talk among large contractors was that project planning was flowing along at surprisingly high levels. This included potential mine development programs and metallurgical design and construction activity. That miners were tightening their belts and trimming the fat was undeniable. But many persistent reports filled the air that the metals industry had bottomed-out and an upturn in some segments, perhaps by July or August of this year, was due.

Technically, the program produced several items of interest. A unique Podbielniait centrifugal contractor was developed for phase disengagement of aqueous and organic at Texas Zinc Company's solvent extraction uranium mill at Mexican Hat, Utah. Rotating drums of this type were used in place of more conventional mixer-settler tanks. Geophysics proved to be a major contributor to the discovery of a large copper orebody in the East Pima district by American Smelting & Refining Company. This was especially interesting since the very same area had been previously eliminated magnetically on the basis of an earlier magnetic survey.

A work cage suspended by rope through a diamond drill hole was successfully used in driving a 6-foot-diameter raw raise a distance of 492 feet at Resurrection Mining Company. The method made possible an average advance of 6.5 feet per shift.

A relatively new bomb reduction technique is apparently capable of reducing the halide or oxide of uranium, tungsten, titanium, molybdenum, vanadium producing high purity product with recoveries of 95% to 98%.

New Lead-Zinc Proposal

Samuel S. Arentz, a well known mining engineer who started school in the lead-zinc camp of Goodsprings, Nevada, presented a new proposal for preserving the domestic lead-zinc industry. His plan, for which he claims no originality, involves the payment of a fixed bonus to the miner over and above the market price. The amount of the bonus is dependent on the production of recoverable lead and zinc by each mine. For instances, the bonus payment for the first 1,000 tons of recoverable lead plus zinc output per year would be $0.05 per pound; for the second 1,000 tons $0.04 per pound; for the third 1,000 tons $0.03 per pound; for the fourth 1,000 tons $0.02 per pound; and for all production over 4,000 tons per year $0.01 per pound.

The estimated cost of the proposed bonuses would total about $50,000,000 per year on the basis of a total domestic production of 985,000 tons annually of lead plus zinc. This sum is approximately the amount of the duties that would be collected on imported metal at present tonnages and at the maximum tariff rates that may be imposed by the tariff commission without congressional action. On the other hand, the cost of such a program is nearly twice the amount that will be collected if import tonnages are reduced to those contemplated by the industry's request for quotas (985,000 tons of lead and zinc) as outlined by the Emergency Lead Zinc Committee. Under the proposal, the difference would be made up by higher tariffs or by direct appropriation by Congress.

Hundreds of eyes popped open when Ward Smith of the United States Geological Survey announced that 40,000,000 tons of low-grade colemanite (calcium borate) had been outlined by 17 drill holes in Southern California. The deposit is located on land controlled by Kern County Land Company, and is about 10 miles east of the extensive sodium borate holdings of United States Borax & Chemical Corporation at Boron, California. Depth to the newly disclosed colemanite body is about 1,000 feet.

Free Uranium Market?

When will uranium be sold by miners to consumers, including foreign buyers? This question is now under close scrutiny by the Atomic Energy Commission. Jesse C. Johnson, director, Division of Raw Materials of the A. E. C., said,

"Our Grand Junction office is now making a survey of the industry problems and the results of this survey should be ready for Commission consideration at an early date. In the past all of our uranium production was needed for the defense program and all domestic concentrate production was under contract to the A. E. C. Therefore, no concentrate was available for sale to others except for small quantities which were released from A. E. C. contracts and licensed for sale for production of certain essential uranium chemicals.

"Since domestic concentrate now could be produced in greater quantity than required for A. E. C. contracts, one of the principal reasons for the Commission being the sole buyer has been removed. It is necessary, however, to establish the detailed conditions for a domestic buyer or foreign buyer to qualify for a license. The principal problem relates to the controls and safeguards with respect to export sales."

Mr. Johnson also defended the October 1957 announcement of the A. E. C. limiting future uranium concentrate purchases to the output of mills which already had contracts in effect with the A. E. C. at that time. Some of these mills are not yet in operation, nor will all be completed by the end of 1958. It is estimated that concentrate production will reach 13,000 tons in 1958 and will level-off at 17,500 to 18,000 tons in 1959.

In his address, Senator Albert Gore of Tennessee implied that he could see no justification for paying a premium for foreign sources of uranium after March 31, 1962, the date that American contract commitments expire. It may be time to take another look at ore stockpiling as proposed by Congressman Carl T. Durham of North Carolina in 1957, said Senator Gore. "If it becomes clear that we can stockpile domestic uranium concentrates at a cost substantially less than that of the current foreign uranium concenrates, we will consider doing so in the national interest." The Senator said that his Raw Material Subcommittee of the Joint Committee on Atomic Energy will hold public hearings on A. E. C. ore procurement policies in March or April. The Joint Committee on Atomic Energy will also hold hearings on the growth, development and state of the atomic energy industry near the end of February. He predicted that uranium will be the principal source of energy during the next 100 years when the use of energy is expected to multiply 47 times over the previous century.

Incentives

There is nothing wrong with the mining industry that a good incentive program couldn't cure, according to Representative A. L. Miller of Nebraska. He proposed incentives for all minerals similar to those now offered to uranium miners. A few years ago we worried about sources of supply of uranium. "Then we developed a long range program with a price incentive. Now we have uranium running out of our ears." Something similar could be done with other metals, said the Con-

ASARCO GEOPHYSICS were outlined by R. J. Lacy (right), chief geophysicist with Salt Lake City headquarters. Paul Harrison, manager Colorado operations, introduced Mr. Lacy.

AEC OFFICIALS REPORT ON URANIUM: Jesse Johnson, director of raw materials (right), and Allan Jones, manager western operations office, reported studies for more mill capacity.

CLIMAX MOLYBDENUM was represented by Frank Coolbaugh, vice president (right), and Dr. Stewart R. Wallace, resident geologist, who spoke on Climax mineralization.

AMERICAN ZINC'S circular air shaft at Mascot, Tennessee was described by Jack Gilbert (right) the man who drilled it. Carl I. Dismant, Dismant Uranium Mines, introduced Mr. Gilbert.

gressman—"we have no long-range minerals policy."

Technical Notes

A symposium on the application of chemical engineering processes to the mining industry could have been labeled the marriage of the chemical and metallurgical fields. Moderated by Dr. Paul Cardwell, Dow Chemical Company and E. H. Crabtree, Colorado School of Mines Research Foundation, two new ion exchange processes were described. One may have application in the minerals treatment industry. Merrill F. McCarty, Dow Chemical Company, gave a few details of ion retardation, the IX process which may have application in the hydrometallurgical field. This process makes use of a new type of resin with an unusual property—both anionic and cationic exchange sites are located on the same bead. The result is that the resin will adsorb both ion types from feed solutions. These resin sites, however, are so closely associated that they partially neutralize each other's electrical charges; thus, the adsorbed ions are weakly held and may be displaced from the resin by the use of water as a regenerate.

At the Young mine, American Zinc Lead & Smelting Company of Tennessee is drilling a 66-inch ventilation shaft using a shot-hole machine. The cost is calculated to be about $100.00 per foot. This compares with a cost of $99.00 to $127.00 per foot which was average for a 36-inch hole and a 48-inch hole recently drilled in West Virginia. Rock being drilled is dolomite and limestone with varying silica content. Length of core pulled is 7 to 8 feet. Longer core will usually break under its own weight. Average penetration per hour drilled has been 1 foot. This was reported by Jack Gilbert, engineer at American Zinc.

Several interesting contributions of research to mine problems were reported by Paul T. Allsman, chief mining engineer, U.S. Bureau of Mines. Micro-seismics, said Mr. Allsman, involves the use of suitable geophones and amplifiers for recording popping and cracking noises generally associated with rock under stress. Through a great deal of testing it is now possible to relate the noise level to the stress in the rock; the crushing strength of the rock is a function of the stress. Micro-seismic instrumentation has found practical application on problems of roof control, stability of underground openings and rock bursts in zinc, iron, oil shale, lead, limestone, copper and coal mines.

The Outlook

William A. W. Krebs, vice president, Arthur D. Little, Inc., engaged in some mental calisthenics to present an optimistic future for uranium consumption in the year 1968. His figures, of course, are subject to several qualifications, such as what reactor types will be built, that the United States is successful in capturing half the foreign market for uranium used in reactor developments, and several others. Basically, he predicted a consumption of United States uranium concentrate of 20,000 tons by 1968. This would include the uranium necessary for power, propulsion, and miscellaneous reactor demand for fuel. Added to total would be the uranium necessary for weapons program of the United States.

After detailing the work of the Emergency Lead-Zinc Committee Charles Schwab of Bunker Hull Company noted three recent straws in the wind. First was a report in *Time* magazine that the White House had quietly shelved its intention to approve tariff aid for United States mining. The second, was a statement of Chairman Wilbur Mills of the House Ways and Means Committee. The statement intimated that though the Hon. Mills was a believer of free trade, he was also becoming increasingly concerned as to the avenue for relief to domestic industries which have been injured by concessions made in trade agreements. The third was Secretary of Interior Seaton's announcement that another long-range mineral proposal would be submitted to Congress; but only after the outcome of the action of the Tariff Commission and the President on the escape clause and quota plan is known.

THE END

URANIUM GOLD AND SILVER banquet was high spot for convention entertainment with speeches, awarding of Mining World achievement plaques, musical concert by University of Colorado glee club and band, and dancing.

MANGANESE MINERS, left to right, Lou Gordon, Nevada Mining Association, Fritz McGonigle, Manganese, Inc., and E. D. Dickerman, Denver consulting engineer.

BUTTE SHAFTS were described by A. R. Sims (right), general superintendent of mines, Anaconda Co. W. R. Jude, superintendent of Colorado operations, New Jersey Zinc Co., at left.

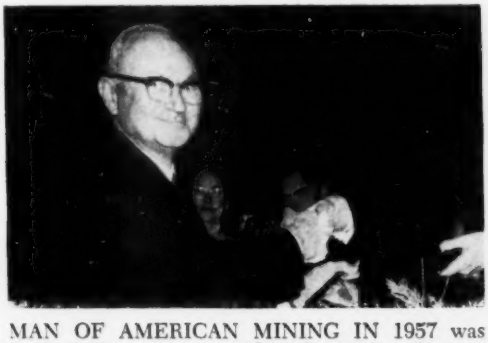
Mining World Presents Annual Awards

In recognition of the achievements and technical developments made by companies and engineers, MINING WORLD makes five annual awards. These awards express an appreciation for the work that is done for the advancement of all mineral sciences and for the enlightened management and operation of mining enterprises.

SMALL MINING COMPANY OF YEAR plaque is accepted by Bob Adams, president, Western Nuclear Corporation. Firm is integrated Wyoming U_3O_8 producer.

UNDERGROUND MINE OF YEAR award goes to president E. Goodner, American Gilsonite Company. George O. Argall, Jr., editor, makes presentation.

OPEN-PIT MINE OF YEAR honor was won by United States Borax & Chemical Company. W. H. Wamsley, superintendent Boron operations, accepts plaque.



MAN OF AMERICAN MINING IN 1957 was P. D. I. Honeyman, president, Inspiration Copper. Award accepted by Carl Stunz because Mr. Honeyman was ill.

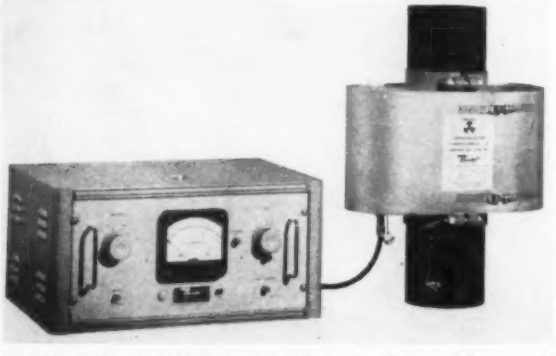
TECHNICAL ACHIEVEMENT OF 1957 was the development of "Zinc Blast Furnace Smelting." Dr. S. W. K. Morgan, research director, Imperial Smelting Corporation Limited, Avonmouth, England, was the recipient of this award. As he was unable to be present, he sent the following message, "Our process is young yet, and it is not easy to see what place it will take amongst the existing methods of zinc production, but the ability to produce lead as well as zinc, and its tolerance of lower grade materials—will have some impact on lead-zinc milling practice. I put on record the teamwork of the Work's staff."

Money Making Methods

Nuclear Density Gauge with Recorder Control Regulates Density in Pipes

Accurate measurement and control of pulp or slurry densities in any part of a mill circuit are now possible with the new Bendix nuclear density gauge with ElectroniK controller.

The gauge containing a cesium radioactive source and ion measuring chamber is mounted and aligned on the outside of the process pulp line. Standard gauges are for 4, 6, 8, 10, and 12-inch schedule 40 pipe. The amplifier-indicator contains a meter which registers specific gravity, percent solids or other related readings. Any standard 0 to 50 millivolt recorder or recorder-controller can be used in conjunction with this equipment for process monitoring or control.



PULP DENSITY GAUGE mounted on pipe line at right records density of pulp flowing through pipe on the recorder at left.

The apparatus can be used to monitor and control densities in ball and rod mill circuits, flue gas recovery systems, dust collectors, flotation circuits, thickeners, and other pulp flow circuits. The control of the liquid or solids content of the pulp can be maintained precisely at any desired point. The measuring element does not contact the pulp; therefore, abrasive and corrosive pulps are easily handled.

The advantages claimed for this apparatus are (1) down time due to pump failures can be reduced, (2) plugged equipment can be virtually eliminated, (3) fuel savings can be realized in processes using kilns to remove water, (4) solids can be efficiently recovered from flue gas, (5) optimum separation by flotation can be obtained, (6) "post mortem" laboratory analyses are replaced by a continuous record of process variations.

Imatrex—New Swedish Blasting Agent Shows Promise for Underground Use

A new explosive, Imatrex, is being used very successfully in underground metal mines in Sweden and Finland. Initial use at the large sub-level-caving iron ore mine of Luossavaara-Kiirunavaara Aktiebolag at Kiruna, Sweden has been interesting because the explosive detonates without toxic fumes and so has been used in areas without ventilation.

Imatrex is a potassium chlorate with practically uniform porosity. It becomes a blasting agent only upon impregnation with a suitable combustible oil such as kerosene.

After impregnation with kerosene which has a specific gravity of about 0.80 and a boiling range between 150 and 300° C., the bulk density of the resultant stick or briquette will be 1.55 to 1.75; for granules, 1.10 to 1.30 according to the degree of compaction. This makes a high bulk density so that the energy content per unit volume of charge space is comparatively large.

Detonation must be by either a No. 6 or No. 8 cap. Temperature of explosion is about 3,200° C. Detonation rate in confined volume is between 3,000 and 4,600 meters per second depending on the density of loading and other factors. Specific gas volume on detonation at 0° C. and 1.0 atmosphere is 450 to 490 liters per kilogram depending on the impregnating oil.

Imatrex is non-combustible and non-explosive in unimpregnated form. It is insensitive to both arctic cold and tropical heat and maintains its blasting velocity for an unlimited period.

The potassium chlorate is not hygroscopic, but is soluble in water. Therefore, Imatrex is made harmless by flushing with water. Of course this precludes its use in any wet hole.

Imatrex and its gases reportedly are odorless and leave no physical ill effects.

How To Make Emergency Pipe Repairs

The emergency pipe repair patch developed by the United States Navy and described in this section for the first time in April 1953 has been of such widespread interest to mine, mill, and smelter operators that current developments and more detailed data concerning the patch and its application are now presented.

This plastic patch has all the simplicity of a first aid bandage but has been successfully used to make repairs in 30 minutes to lines carrying water and air whose pressure does not exceed 300 pounds per square inch and whose temperature is not above 200° F.

The metallic plastic patch can be used on most types of ruptures, including a severed section of pipe that has been completely separated, a ruptured elbow that is located on any curved section of pipe, a compound rupture with protruding edges, or ruptures in fittings.

To apply a patch to a severed or ruptured metallic pipe requires approximately 15 to 20 minutes, and pressure can be restored to the system within 30 minutes after applicaials before hardening are pliable and are easily applied.

LEAKING PIPE is covered with a fibrous glass mat made of fibers bonded together with synthetic resin, then wrapped with impregnated tape 1½ inches wide to provide adhesive bond.

FINISH WRAPPING pipe with Kraft paper and tie with twine to prevent loss of resin until the patch has had time to harden; usually about 30 minutes.

The maximum patch life is unknown as yet, but experience has shown that a properly applied patch will last until permanent repairs can be made.

The metallic pipe patch is composed of synthetic resin and activator, a void cover, fibrous glass tape, and a fibrous glass matting. The void cover is a cloth woven of glass fibers that has been treated with a synthetic resin and is used to cover the rupture initially. The activated synthetic resin is used to impregnate the tape and mat, thus providing the adhesive bond of the patch. The tape is 1½ inches wide and provides the primary strength of the patch when wound around the rupture. The fibrous glass mat is made of material woven of glass fibers that has been bonded together with the synthetic resin. The retaining cover, which completes the patch, is made of Kraft wrapping paper secured with twine. It covers the entire patch to retain the resin within the patch.

Shortly after applying the patch, a chemical reaction takes place resulting in thermal radiation accompanied by temperature rise. Under normal room temperature conditions the rise is gradual until it reaches 120° to 135° F. Upon reaching this point the temperature rise accelerates rapidly until, within a matter of seconds, it reaches its peak of about 350 degrees. This is called "kickover." After "kickover," the patch begins to cool and solidify.

The general procedure to follow in preparing for the application of the plastic pipe patch is as follows:

1. Have all of the materials required ready for use. Then clean the surface to be patched, removing all moisture, scaling, etc.
2. Cut the glass cloth, glass tape, and void cover to size large enough to overlap the leaking area.
3. Pour the activator into the resin.
4. Mix the resin and activator for approximately three minutes.

General procedure to follow in actual application of the plastic pipe patch is as follows:

1. Apply the mixture of activated synthetic resin generously over the area to be patched including the area in and around the actual break.
2. Apply the void cover to fit the pipe, completely coating it with activated synthetic resin.
3. Saturate the glass matting with activated synthetic resin and apply in strips over the ruptured area.
4. Bandage the entire section with the glass tape coated with activated synthetic resin.
5. Wrap the finished patch with Kraft paper. Secure with twine to prevent the resin from dripping until the patch has had time to harden.

Some precautions that should be followed during the application of the patch are as follows:

1. Do not mix the resin and activator until ready for use. At 70° F. you have only about 10 minutes of working time after mixing.
2. The resin and activator should not be stored permanently where the temperature will exceed 100°.
3. Immediately after use, clean hands and tools with hot water and detergent. Do not allow activated resin to harden on tools and surfaces.
4. Do not vary the proportions of resin and activator and do not add any foreign matter to the prepared mixture.
5. The use of rubber gloves is mandatory.
6. Keep the material away from your face and eyes by wearing protective face shield.

Dual Use Front End Loader

Mine personnel at Kennecott Copper Corporation's Santa Rita, New Mexico open-pit mine have developed the dual purpose front end loader shown in the accompanying photograph. Normally the machine is used for loading and moving ore and waste. With the addition of a special hydraulically actuated clamp attachment on top of the bucket, the loader can be used for setting trolley poles. These poles support the electric trolley line which is the power source for the pit locomotives. When a track shift is necessary, the trolley poles must also be shifted.

FRONT END LOADER with hydraulic grab moves trolley poles at Kennecott Copper's Santa Rita pit as shown in *Kennecott Chinorama* photograph.

With the new "grab" on the loader, the poles are picked up, moved, and placed in their new position in a few seconds.

The grab attachment was designed and developed by Victor Patten, bulldozer foreman; William May, an industrial engineer; and Charles Slout, line gang electric foreman.

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TYPE S
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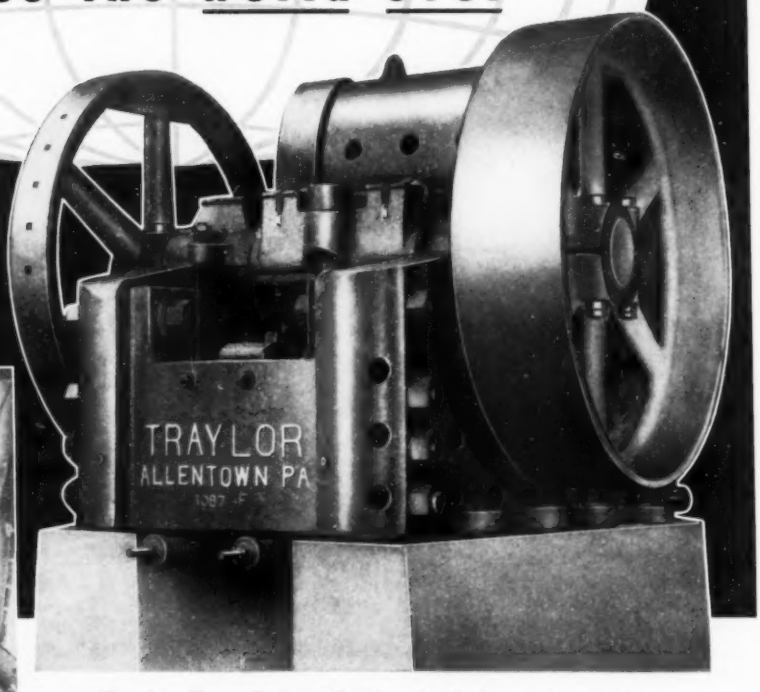

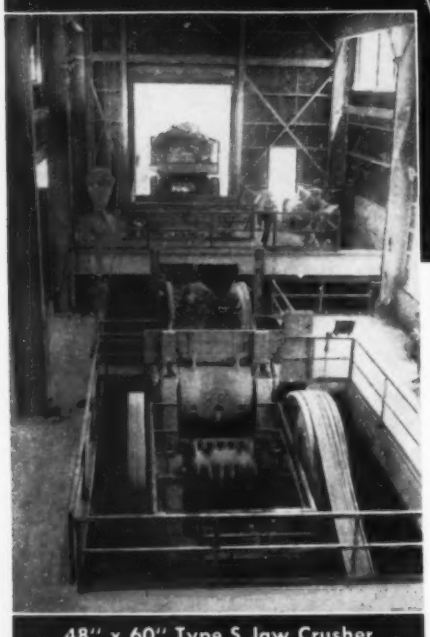

48" x 60" Type S Jaw Crusher in Portland Cement Plant.

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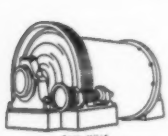
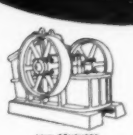

BALL MILLS

ROTARY KILNS

APRON FEEDERS

PRIMARY GYRATORY CRUSHERS


JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS

United States

Personalities in the News——

CHARLES R. KUZELL (left), vice-president in charge of western activities of Phelps Dodge Corporation since 1955, has retired from active service with the company and will be succeeded by WALTER C. LAWSON. Mr. Kuzell, who has been with Phelps Dodge since 1944, will continue as director but will make his home in Phoenix, Arizona. Mr. Lawson, also general manager of western operations, has been associated with the company since 1926. Headquarters for Phelps Dodge's western activities is in Douglas, Arizona.

Olaf P. Jenkins, state mineralogist and chief of the California State Division of Mines for eleven years, recently retired after 29 years of continuous service with the California State Division of Mines. Dr. Jenkins is now associated with the consulting firm of Carroll E. Bradberry & Associates of Los Altos, California, as economic geologist.

James D. Moore has been promoted to production manager of Vitro Uranium Company at Salt Lake City, Utah, a division of the Vitro Corporation of America. Mr. Moore joined Vitro's staff in 1951 as a chemical engineer. Other Vitro appointments include **M. T. Ellis** as operation superintendent; **T. G. Rukavina** as plant engineer in charge of engineering and maintenance; **G. W. Hansen** to chief chemist in charge of analytical and process laboratories; and **L. D. Lash** as metallurgical engineer.

S. Warren Hobbs, geologist with the Spokane regional office of the United States Geological Survey, has been promoted to chief of the mineral deposits branch with offices in Washington, D. C. Mr. Hobbs is also president of the Northwest Scientific Association.

M. S. Bell, former refinery superintendent of Phelps Dodge Corporation's electrolytic copper refinery in El Paso, Texas, has been promoted to plant superintendent.

JERRY BRYANT will be the new mill superintendent at Fremont Minerals, Inc.'s uranium mill at Riverton, Wyoming. For the past two years, Mr. Bryant has been mill foreman of Mines Development Corporation's mill at Edgemont, South Dakota. Western Knapp Engineering Company has already begun construction of the Freemont mill, located on the Wind River Indian Reservation just outside of Riverton.

Barney Greenlee has accepted a position with the Utah Construction Company with headquarters in California. Mr. Greenlee was formerly employed as resident manager of Resurrection Mining Company's operations at Leadville, Colorado.

Richard B. Nelson has joined the staff of International Minerals & Chemicals Corporation at Carlsbad, New Mexico as mine project engineer. Mr. Nelson was most recently employed with the Hidden Splendor Mining Company at Moab, Utah.

Earl H. Miller, resident manager of United States Borax & Chemical Corporation's United States Potash Company Division at Carlsbad, New Mexico since 1956, has been promoted to vice president of the Division.

Frank Finch is now employed as assayer on the staff of the Texas-Zinc Minerals Company in Mexican Hat, Utah.

B. DeWitt Mitchell, New York geologist and petroleum production engineer, has accepted a position as executive vice president of Yucca Mining & Petroleum Company, Inc. Mr. Mitchell will make his headquarters in Albuquerque, New Mexico.

Dave Cole, mining engineer employed by the Idarado Mining Company at Ouray, Colorado, was recently transferred to the safety division of the company's Telluride, Colorado mine.

HERBERT M. WEED (right) was recently elected vice president of Anaconda Sales Company and Anaconda Export Company, both subsidiaries of the Anaconda Company. W. E. KENNEDY, executive vice president, CLARENCE GLASS, vice president, and JOHN A. O'BRIEN, assistant secretary, have retired from their positions with both companies.

Philip P. Powers, formerly employed by the Andes Copper Mining Company in Potrerillos, Chile, has returned to the United States and is now associated with the Dulaney Mining Company at Grand Junction, Colorado.

Frank D. Vincent has been promoted to general superintendent of Interlake Iron Company's plant in Beverly, Ohio.

Philip B. Dettmer has accepted a position as staff metallurgist with the M. A. Hanna Company, with headquarters in Cleveland, Ohio. Mr. Dettmer was formerly employed with the engineering and construction firm of C. F. Braun.

Arthur C. Erickson has been appointed mine inspector for the Eastern District of United States Steel Corporation's Oliver Mining Division, replacing **Lawrence Dopp** who retired recently. Mr. Erickson formerly served with Oliver's engineering department at Virginia, Minnesota.

J. A. MECIA, former manager of Utah Construction Company's Mines Department in San Francisco, California, has been promoted to vice president. Prior to joining Utah's staff, Mr. Mecia was employed by the Bradley Mining Company in Idaho, where he gained experience in open pit and underground mining and treatment. He will continue to be in charge of Utah's mining activities in the United States. Mr. Mecia is also vice president of Lucky Mc Uranium Corporation with uranium operations in Utah.

Thomas L. Boyle, chief of aerial exploration for the United States Atomic Energy Commission in the western United States since 1953, received a Superior Performance certificate and cash award for his outstanding work in organizing and directing the Commission's airborne uranium prospecting activities for the past five years. Mr. Boyle is attached to the Grand Junction, Colorado Operations Office, with headquarters in the Denver area.

Lawrence A. Roe, manager of process engineering for International Minerals & Chemical Corporation in Chicago, Illinois, will assume duties as director of central engineering and will direct the company's programs in construction, process, and general engineering.

Raymond E. Tuttle, manager of the technical department of International Minerals & Chemical Corporation's Bonnie plant in Bartow, Florida, was recently promoted to assistant manager of engineering, Florida operations. In his new position, Mr. Tuttle will be in charge of engineering and maintenance and will retain supervision of the technical department.

T. M. HIPP (left), former chief construction engineer with Phillips Petroleum Company, is now manager of the company's newly formed mining and milling department in Bartlesville, Oklahoma. A. A. RUOHO (right) will serve as general superintendent of the new department, and R. W. JENKINS has been appointed mines superintendent. Mr. Ruoho, formerly superintendent of the company's plant at Phillips, Texas, and Mr. Jenkins, who has been mine superintendent of the Ambrosia Lake project since last August, will make their headquarters at the company's Ambrosia Lake uranium processing plant now under construction near Grants, New Mexico.

Arthur Pomeroy, former lead furnace operator at Kennecott Copper Corporation's Hayden, Utah plant, has been promoted to sponge iron shift foreman. **Clifford Eppler** was promoted to electrical inspector at the Hayden plant.

Dr. Donald J. McPherson has been appointed manager of the Metals Research Department, Armour Research Foundation of the Illinois Institute of Technology, Chicago, Illinois. Dr. McPherson, former assistant manager of the metals department, replaces **Robert A. Lubker** who is now director of research at the Alan Wood Steel Company in Conshohocken, Pennsylvania.

William J. Coulter, retired vice president of Climax Molybdenum Company's Western Operations, received the William Saunders Gold Medal, awarded by the American Institute of Mining, Metallurgical, and Petroleum Engineers. Mr. Coulter earned the award for "distinguished achievement in contributing in general to the success of Climax Molybdenum Company, and for developing mining practices of the Climax mine," at Climax, Colorado.

Newly elected chairman of the El Paso, Texas section of the American Institute of Mining, Metallurgical, and Petroleum Engineers is **John L. Douglas**, manager of Joy Manufacturing Company's El Paso Office. **K. D. Loughridge**, assistant manager of the Southwest Division of the American Smelting & Refining Company is vice president, and **Guy E. Ingersoll**, member of the mining faculty at Texas Western College, was elected secretary-treasurer.

Stanley W. McDougall has been selected to fill the newly created position of manager of Bunker Hill Company's operations at Kellogg, Idaho. Mr. McDougall, former manager of mines, will oversee operations of all Kellogg plants. **Joseph E. Gordon**, former mine superintendent, will take over duties as Kellogg mine manager.

Norman E. Hanson of Basic, Incorporated at Gabbs, Nevada, left for Europe recently to inspect Radio Free Europe installations at Munich, Germany. Mr. Hanson is the Nevada chairman of the Crusade for Freedom, which finances the Munich project.

Stanley Walker, former chief engineer for Climax Molybdenum Company in Climax, Colorado, has been appointed head of the newly created Managerial Engineering Department. **Max Gelwix**, former planning engineer, will succeed Mr. Walker as chief of the Engineering Department.

Joseph C. Abeles has been elected a director of Haile Mines, Inc., Mr. Abeles is also director, vice president and treasurer of Kawecki Chemical Company of Boyertown, Pennsylvania, and director of Hexagon Laboratories of New York City and Talco Engineering Company of Hamden, Connecticut.

Clifford A. Mark, who has been serving as geological engineer for Columbia Iron Mining Company, is now assistant supervisor of raw materials exploration for the company. His office will be at the United Steel Corporation's Genova Works near Provo, Utah. Columbia Steel is a U. S. Steel corporation subsidiary.

Two new divisions, the Production Evaluation Division and the Source Materials Procurement Division, have been established by the United States Atomic Energy Commission at the Grand Junction Operations office to replace three former operating divisions, the Mining, Exploration, and Concentrate Procurement Divisions. **Arthur E. Granger**, area manager at Salt Lake City for the past year and a half, is the new director of the Production Evaluation Division. **David D. Baker**, director of the Mining Division since 1956, is now deputy director of the new division. **Charles E. Tonry**, former director of the Concentrates Procurement Division, is the director of the new Source Materials Procurement Division.

Morley Romanuck, formerly employed as geologist with the Quebec Cartier Mining Company, Ltd. in Quebec, Canada, is now associated with the W. S. Moore Company, Duluth, Minnesota.

Johnson Crawford, formerly superintendent of the New Jersey Zinc Company's operations in Tennessee, has been promoted to general superintendent for Tennessee and will make his headquarters at Jefferson City. **F. H. Main**, former assistant superintendent of Tennessee operations, will replace Mr. Crawford as superintendent. **R. E. Radabaugh**, also employed by New Jersey Zinc as assistant to the Western manager of mines, has been promoted to assistant manager of exploration with headquarters in Grand Junction, Colorado.

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Newsmakers in International Mining

GEORGE E. MORRIS, superintendent of Chile Exploration Company's copper smelter at Chuquicamata, Chile, since 1951, has been promoted to director of metallurgy for the Cananea Consolidated Copper Company, S.A. Both companies are subsidiaries of the Anaconda Company. Mr. Morris, who has served with Anaconda since 1925, will make his headquarters at Cananea, Sonora, Mexico.

Dr. J. C. Nixon, formerly manager of the Anzin Development Laboratory, Avonmouth, England, is now employed as group research metallurgist with the Consolidated Zinc Pty. Ltd. at Melbourne, Australia.

Dr. Aaro E. Aho, geological engineer, has opened a consulting office at 4219 Lions Avenue, North Vancouver, B. C., Canada. Dr. Aho was most recently employed as exploration manager for British Yukon Exploration Company, Ltd. in Yukon and northern British Columbia, and has also done consulting work in engineering geology, mining exploration, and ground water.

C. Walters has been selected to fill the newly created position of assistant manager at Nchanga Consolidated Copper Mines, Ltd.'s operations at Chingola, Northern Rhodesia. Mr. Walters will be responsible for modernization of equipment and operations.

S. O. Corp, mining engineer formerly employed with the Cryolite Company at the world's only cryolite mine in Greenland, recently returned to Virum, Denmark.

Thorry Kiaer, managing director of Orkla Grube A/B in central Norway, will retire next year. **Per Palmer,** assistant director, will succeed him.

J. M. van de Plasse, metallurgical engineer, has accepted a position with Earnshaws Docks and Honolulu Iron Works in the Philippines. Mr. van de Plasse was formerly technical manager of a large metallurgical equipment manufacturing company in Australia.

H. Z. STUART was recently appointed manager of exploration for the Phelps Dodge Corporation. Mr. Stuart, who joined the company in 1936, has been resident engineer of mines in New York since 1951. His new duties will include direction of exploration activities of the corporation's Canadian subsidiary, Phelps Dodge Corporation of Canada, Ltd. With Mr. Stuart's appointment, headquarters for exploration were shifted from Phelps Dodge's western operation office at Douglas, Arizona, to the New York offices.

K. E. MacKay has resigned as manager of Bancroft Mines, Ltd., Northern Rhodesia, to accept a position as manager of Nchanga Consolidated Copper Mines, Ltd. **V. A. Gladman,** former manager of Nchanga Mines, has resigned and plans to return to Canada. **A. J. Brink** will replace Mr. MacKay at the Bancroft Mines. Mr. Brink has been employed as assistant consulting engineer at Anglo American Corporation's headquarters in Johannesburg, Union of South Africa.

James A. Pike, associated with the Newmont Mining Corporation of Canada, Ltd., has been elected to succeed **Henry Hill** as president of the British Columbia and Yukon Chamber of Mines.

W. J. Nock has been selected to succeed **C. F. Jordan** as general manager of American Smelting & Refining Company's Mexican Mining Department at El Paso, Texas. Mr. Jordan recently retired because of ill health. In the fall of 1957, Mr. Nock was promoted to assistant general manager and served as assistant manager prior to that advancement. **A. J. Yeager,** former assistant manager, will assume duties as assistant general manager of the Mexican Mining Department, and **J. G. Urquhart** will be promoted to assistant manager. Mr. Urquhart has been serving as acting superintendent at Parral, Mexico.

Dr. John F. Paterson has been retained by the Ontario Department of Mines to make a study of silicosis. Dr. Paterson is chief of the chest clinic at Toronto Western Hospital and a member of the faculty of the University of Toronto.

Juan de G. Rodriguez, Philippine Secretary of Agriculture, and **Benjamin M. Gozon,** Director of Mines, are currently touring European capitals to interest government officials in the possibility of developing vast nickel deposits on Nonoc island.

Norbert F. Koepel has been appointed assistant to the vice president of both Chile Exploration Company and Andes Copper Mining Company, Anaconda Company subsidiaries. **Glen S. Wyman** has been named general manager of both companies and **Robert C. Becker** has been appointed resident manager of the Chile Exploration Company with headquarters in Chuquicamata, Chile.

Donald M. Wagg is now chief geophysicist for Rio Canada Exploration, Ltd., the exploration branch of the Rio Tinto Mining Company of Canada, Ltd. Mr. Wagg will continue as operational manager of Gresham Exploration, Ltd., also a Rio Tinto subsidiary.

Roland Merwin has accepted a position as general manager of Negociacion Minera Santa Maria with headquarters in Matehaula, Mexico. Mr. Merwin has been employed by the Neptune Gold Mining Company in Bonanza, Nicaragua for the past seven years, and prior to that had worked in the United States, Ecuador, Cuba, Chile and the Philippines.

ROBERT HENDERSON (right) resident manager for the Climax Molybdenum Division of the American Metals Climax Corporation, Climax, Colorado, and S. WALLACE, Climax geologist, recently inspected Rhodesian Selection Trust properties in the Rhodesian Copperbelt, and the Tsumeb Corporation, Ltd. in South West Africa. The merger of Climax Molybdenum and American Metals Company has brought Climax in close association with the Rhodesian Selection Trust Group, through American Metals' controlling interest in the group.

A. Raja Rau is now employed as mining geologist with the Nagri Mining Company, Private, Ltd. in Dandeli, southern India.

Luis Villa-Senor has resigned as mines manager for the Mazapil Copper Company in Saltillo, Mexico, to accept a position as managing director of the Fresnillo Mining Company, with headquarters in Mexico City. **Derek Norris,** who recently returned from England, will succeed Mr. Villa-Senor at Saltillo.

George C. Lipsey, vice president and general manager of Britannia Minng & Smelting Company, Ltd., recently retired after 34 years of service with the company and is now living in Vancouver, B. C., Canada. Since 1924 Mr. Lipsey has been associated continuously with Britannia and its parent organization, Howe Sound Company. During the past two years he has been in charge of Canadian operations of both companies, with headquarters at Britannia Beach, Canada.

Dr. B. J. Kochanowsky, associate professor of the Mining Department at Pennsylvania State University, spent last summer in Germany participating in experimental research of large-scale blasting. This research is sponsored by Rheinische Kalksteinwerke Company at Wulfrath, Germany, a subsidiary of Krupp.

E. H. Brinley, formerly associated with the Anaconda Company's operations in Chile, South America, is now employed as resident geologist at Port Arthur, Ontario, Canada for the Anaconda Company (Canada) Ltd.

PROFESSOR GEORGE A. DE NEVE, formerly chief of the Exploration Department of the government-owned Bangka Tin Mines, has been appointed dean of the faculty of Mathematics and Natural Science at the "Andalas" University at Bukittinggi in Central Sumatra. He is also head of the University's Department of Economic Geology.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

Winter-Weiss Portadrill On Eimco 105 Tractor

A new Portadrill, Model 105TA, engineered for blast hole and exploratory drilling in all types of rock, has completed exhaustive field tests and is now available to the industry by the Winter-Weiss Co., Denver, Colorado.

The drill is mounted on an Eimco 105 Diesel crawler tractor with 125-143 hp. Two rotary vane compressors, furnishing 1,000 cfm, remove the cuttings from the hole with normal pressures from 15-17 psi, or up to 50 psi for cleaning holes in wet or sticky material. A cutting collection system is also available for exploration or sampling work.

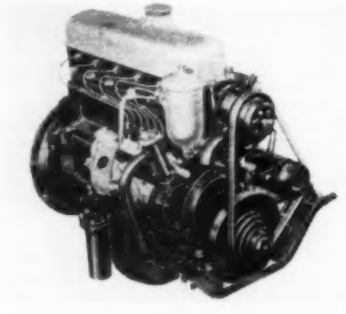
In sandstones, shales, limestone and other similar formations the 105TA has a rated capacity of 300 to 400 feet of nine-inch holes per shift using standard roller cone rock bits. For additional information contact The Winter-Weiss Co., 2201 Blake St., Denver 5, Colorado.

Giant Feeder Shipped To Belgian Congo

A giant SAMCO Feeder, believed to be the world's largest feeder, was recently completed and shipped by Stephens-Adamson Mfg. Co., for use at Union Miniere du Haut-Katanga, Belgian Congo, Africa. It will handle copper ore, feeding it to primary crushers in a new plant designed specifically to process copper. The big feeder will handle 550 tons of ore per hour. It weighs approximately 180,000 pounds, is 18 feet wide, 53 feet long, and 11 feet in height. For further information write company in Aurora, Illinois.

Accurate Core Samples With New Jet Drill Rigs

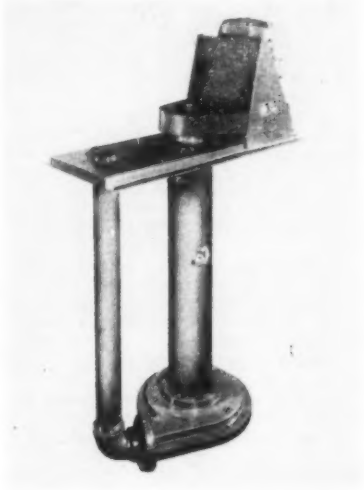
Developed by Carpco Manufacturing, Inc. Models Nos. DR165 and DR1500 Drill Rigs are designed for exploration of beach sand mineral deposits. Combining high maneuverability and ease of operation with maximum sampling accuracy, both models are excellent machines for prospecting or plot drilling unconsolidated beach or dune deposits above or below the water table. For additional information write the company at Box 3272, Jacksonville 6, Florida.



Mercedes-Benz Diesel Available in U. S.

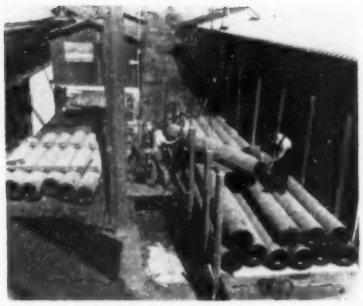
The OM 321 Mercedes-Benz Diesel engine is now available in the United States through the Utica Division of the Curtis-Wright Corp. This engine, which is built and designed to high European standards of quality, performance and economy, is manufactured in the 60 to 96 hp range from 1500 to 2600 rpm.

It is a six-cylinder, vertical-in-line, four-cycle, liquid cooled engine with a compression ratio of 19.5 to 1. Weighing 782 pounds, the engine has over-all dimensions of 36 inches long, 28 inches wide, and 41 inches high. The Daimler-Benz pre-combustion chamber type system provides a smooth, even, quiet, smoke-free operation over a wide range of speeds and loads. Write company in Utica, Michigan.



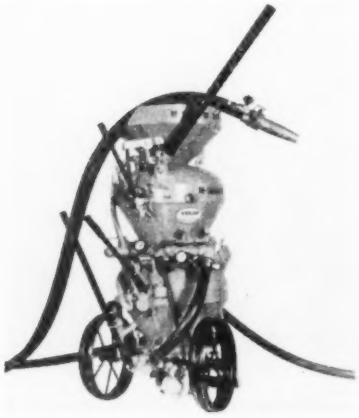
SRL Vertical Sump Pump Handles Up To 1400 GPM

The new Denver SRL Vertical Sump Pump is a standard, vertically-designed rubber-lined pump for sump and general pumping operation. The Denver SRL-V is available in 2-inch by 2-inch, 3-inch by 3-inch, 5-inch by 5-inch, and 6-inch by 6-inch sizes with capacities from 20 to 1400 gpm. The pump proper operates submerged below the level of the liquid in the sump. A suction flange is provided so a pipe may be extended into the sump up to the limit of suction lift. The bottom suction eliminates the possibility of an air lock. Pump is applicable where feed head is low such as on classifier overflow. The high efficiency of this pump means low horsepower requirements. Write Denver Equipt. Co., Box 5268, Denver, Colorado.



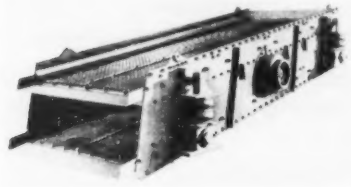
Wood Pipe For a Large Mining Co.

Here's a shipment of wood pipe going to a large mining operation. The Douglas fir pipe, manufactured by National Tank & Pipe Co., Portland, Oregon, is available in various diameters and features both corrosion resistance and long life. For additional information write company at 2301 North Columbia Blvd., Portland, Oregon.



Concrete Gunning Machine By Airplaco

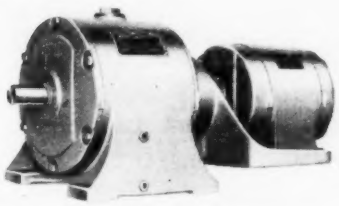
A new and higher production Airplaco concrete gun, the Model 1600-H Nucretor is announced by the Air Placement Equipment Co., Kansas City, Missouri. This gun has a maximum production or gunning rate of nine cubic yards per hour. The Model 1600-H is designed and recommended for gunning applications requiring high volume production but it can be regulated and controiled for any production rate from two to nine cubic yards per hour. For additional information write company at 1009 W. 24 St., Kansas City, Missouri.



Air Springs For Vibrating Screens

Following two years of successful field tests, Allis-Chalmers has announced the introduction of air springs for its vibrating screens to afford maximum isolation of vibration, quick operation and reduced maintenance costs. The tests were conducted on a 6- by 14-foot screen weighing about 10,000 pounds.

Constructed of durable nylon cord and special high tensile strength, heat-resistant compounds, the air springs provide 98 to 99 percent vibration isolation, depending upon the air pressure used. They are easy to install and there are no mechanical parts to lubricate or service. One size can accommodate a wide range of screen sizes. For more information, write to: Allis-Chalmers Manufacturing Co., Milwaukee 1, Wisconsin.



Western Gear Corp. Has New StraitLine Gearmotor

Western Gear Corporation announces the design, manufacture and marketing of its own line of StraitLine integral and all-motor gearmotors ranging from one to 60 hp and from nine to 520 rpm. Important features of the Western Gear StraitLine gearmotors are interchangeability of gear sets and motor packages in the field without disconnecting the gearmotor from its foundation or the driven shaft; changing of ratio in the field, quickly and simply, when output speed variation requirements arise; easier servicing in the field because gear housings are accessible from either end and flexible inventory through the "building block" system of parts standardization. For further information write company at Box 182, Lynwood, California.

New Portable EM Survey Unit

Field testing of a new and versatile portable electromagnetic prospecting unit has recently been announced by the Kellog Exploration Co. This light-weight unit, employing principles of operation which have proved effective in locating sulfide ore bodies, is fully portable, requiring only two persons for operation. The comparative speed with which observations can be made, (thirty seconds per station), plus an unusual number of electromagnetic parameters which can be measured, make this unit a significant advance in the field of electromagnetic surveying. Write company at 3301 North Morengo Ave., Altadena, California.

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1102-S	10"x3 3/8"	1/2"-5/8"
6-S	6"x1 1/4"	3/8"-1/2"
8-S	8"x1 1/4"	3/8"-5/8"
62	6"x1 1/2"	3/8"-1/2"
106	6"x1 1/2"	3/8"-1/2"
108-R	8"x1 1/2"	3/8"-5/8"
110-R	10"x1 3/4"	3/8"-5/8"
112-R	12"x1 3/4"	3/8"-5/8"
410	10"x1 3/4"	3/8"-5/8"
412	12"x2 1/2"	3/4"-3/8"

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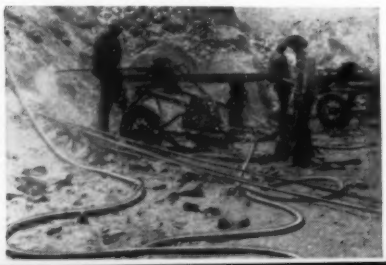

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Marions in Asbestos

This 6-yard Marion 4161 mines asbestos in south-central Quebec where nearly half the world's supply is produced. The 4161 and two 3-yard Marion 111-M electric shovels maintain a steady digging pace 16 hours a day in temperatures as low as 30 below zero.

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Kennecott Purchases Consolidated Coppermines' White Pine County, Nevada Property for $8,400,000

Kennecott Copper Corporation has purchased all of the mining properties of Consolidated Coppermines Corporation in White Pine County, Nevada. The $8,400,000 sale includes Consolidated Coppermines' Tripp pit, its contiguous holdings in Kennecott's adjacent Liberty and Veteran pits, numerous mining claims, water rights, surface buildings, equipment, company-owned community of Kimberly, and other real estate. Involved in the transaction were only the White Pine County properties, with Coppermines still retaining its other interests.

Kennecott, Coppermines and their predecessors have worked side by side at Ruth and Kimberly for 50 years. All of Coppermines' ore has been milled, concentrated, and smelted by Kennecott's reduction plant at McGill. When formed and until 1922, it was Consolidated Copper Company. Since 1922 it has been Consolidated Coppermines Corporation.

Until 1955, CCC or "Con Copper" was an underground miner at the Richards, Alpha, Emma, and Morris. More than 27,000,000 million tons of ore were cave mined at the Emma and Morris. But openpit mining was not new to the staff either, for a small pit known as the Tonopah was placed in production late in 1943. Output reached 2,500 tons per day using 2-yard shovels and 14-ton trucks. The urgent demand for copper, coupled with the war-time shortage of miners, was the reason for open pitting and at that time it was a mere sideline compared to underground operations.

In 1950 Coppermines again thought about open pitting and hired the Isbell Construction Company of Reno, Nevada to strip and mine 3,000,000 tons of ore. Operations started in August on the south slope of Old Glory Hill adjacent to the Morris mine. This was named the Morris pit. In 1953, a second pit known as the Brooks was started with Isbell again the contractor. Exploration by churn drilling, coupled with reexamination of older churn drill logs, indicated a substantial tonnage of low-grade ore in the area around these two pits. In 1954 and 1955 very close churn drilling over old caved areas in the Morris pit area confirmed substantial reserves.

Management then (it was March 1955) outlined a new pit and named it for Coppermines' president Chester D. Tripp. It was estimated that more than 60,000,000 tons of ore and waste would be mined at the Tripp pit with a stripping ratio between 2.5 and 2.7 and 1.0.

Since 1955 the Tripp open pit has been CCC's most important operation. In that year more than $1,700,000 was spent for new open pit equipment, and auxiliary facilities and buildings for this pit. In 1956 another $750,000 was expended to purchase additional electric shovels, Diesel trucks, a rotary blast hole drill, and other equipment for the Tripp pit.

In 1957, as the pit deepened, installation of an inclined skip haulage way was started so that ore could be more economically mined without a major increase in stripping ratio. This new skip hoist was scheduled for operation by the first of April 1958. Kennecott has also announced plans for a similar skip hoist at its nearby Liberty pit. With the plan now to close the Tripp pit, Kennecott has not announced whether installation will continue at the Tripp or the hoist, skips etc. will be installed at the Liberty instead of the separate unit planned by Kennecott.

Production figures at the Tripp pit joint venture Veteran and Ruth pits through 1956 follow:

Item	*1955*	*1956*
Tons ore mined and shipped to mill	3,180,713	2,700,568
Pounds copper	35,320,574	35,278,526
Ounces gold	17,884	21,927
Ounces silver	48,919	52,917

In 1956 83.7 percent of this tonnage was from Tripp and about 80 percent in 1955. As of December 31, 1956, 15,044,000 tons of waste and 2,881,100 tons of ore had been mined at Tripp. No figures have been released for CCC's 1957 production but they are not believed to be much different than 1956 output.

CCC has not published grade of reserves but ore in 1956 averaged about 11.2 pounds of recovered copper. A large tonnage of low grade was treated that year because of high copper price. In 1955 ore was higher grade—about 13.1 pounds. Gold and silver income was appreciable in both years.

For Kennecott the purchase is an excellent one. It permits unit operations for the district. Kennecott can now plan and schedule mining from several ore bodies as needed to fulfill grade and tonnage quotas. Kennecott now practically doubles its off-track open-pit mining equipment—most of it almost new, too. And perhaps most importantly—Kennecott gains over 50,000,000 tons of copper reserves.

A P&H shovel loads ore in the Tripp pit of Consolidated Coppermines.

The *Sunshine Mining Company* of Spokane, Washington, has announced that exploration work will be continued this year at the *Big Bear* copper prospect in the Courtland-Gleeson district of Cochise County, Arizona. Current work is confined largely to churn drilling, contracted to Lyon Drilling Company of Phoenix, with one churn drill operating. Results of the 1957 churn drilling program were said to be sufficiently encouraging to justify continued exploration. The Big Bear prospect, also known as the *Highland* mine, is a part of the old *Great Western Copper Company* group, and consists of 32 claims. Directing the work for Sunshine are Earl Ellstone, resident manager; and Harry Boyer, mining engineer.

The *Mesa Ives Mining Company, Inc.* has announced tentative plans for a manganese mining and milling operation in the Chevelon Ranger Station area, 50 miles south of Winslow, Arizona. The company is seeking permission from the Winslow City Council to use about 500,000 gallons of water annually from the Clear Creek watershed for milling purposes. Work on the pilot plant is scheduled to start this month, the plant to have a daily capacity of 10 to 15 tons of concentrates. Officers of the company are Rufus Belcher, president, and his brother Earl Belcher, vice-president, both of Virginia; Yates Heywood, secretary; and Jack Schulze, Holbrook, Arizona, general manager.

Duval Sulphur and Potash Company reports that development of its *Esperanza* copper mine in the Twin Buttes area of Arizona is progressing satisfactorily, with all work slanted toward production in early 1959. *Stearns-Roger Manufacturing Company* has the contract for milling facilities and construction of the 10,000-ton daily capacity plant is underway. Stripping of the 5,000,000 tons of overburden was contracted to the *Isbell Construction Company* last year and actual work started in November. A new 7.5-mile road from the mine to the Tucson-Nogales highway has been built, and about 7 miles of new 16-inch pipe has been laid from the mill site to water wells developed in the Santa Cruz Valley to supply water for the mill. A loading ramp is to be constructed at the railroad, about two miles south of Sahuarita. G. E. Atwood of Tucson, Arizona is resident manager.

Phelps Dodge Corporation has put into effect a 9 percent cut in copper production. The cutback, according to Phelps Dodge officials, means that the company will be producing at about 78 percent of its 1956 output. The new work schedule calls for 10 days of operation followed by a four-day shutdown every two weeks at the *Morenci* and *Ajo* branches and at the *Lavender Pit* at Bisbee, Arizona. Previously, these properties were on an 11-day work schedule and a three-day shutdown. The *Copper*

Queen branch underground schedule has been changed from alternate weeks of five and six working days to a regular five-day week basis.

The *Monolith Portland Cement Company* of Tehachapi, California, has taken a lease on the *Snowball* group of fluorspar claims, located in the Harqua Hala Mountains southwest of Aguila, Arizona. Both development work and production are in progress. Roads have been improved materially and the shaft sunk to a depth of 100 feet. Twelve men are employed, working on a three-shift basis. Some production is being trucked to Monolith's plant at Tehachapi, by way of Salome, Arizona, although major shipments will go by rail, the first having been made the last week in January. C. W. Hoffman, Aguila, Arizona, is in charge for Monolith.

A proposal to construct a dam on East Clear Creek, near the Mogollon Rim south of Winslow, Arizona, and pump 13,000 acre-feet of water annually over the Rim into the East Verde River reportedly has been made by *Phelps Dodge Corporation* to several interested power and irrigation projects. The water will be needed to maintain and expand the Morenci mining operations of the company. Phelps Dodge would deliver the water to the Salt River Project in exchange for water it takes from other streams on the drainage system.

Close to 500,000 pounds of copper are recovered monthly from the leaching operations at the *Castle Dome* division of *Miami Copper Company*, Miami, Arizona. The copper precipitates are trucked to Miami, then shipped by rail to the *Phelps Dodge* smelter at Douglas. Since December 1953, when exhaustion of ore reserves caused cessation of regular mining and milling operations at the Castle Dome open pit, all activities there have been limited to water leaching of the mine dump. A regular crew of nine men is employed in the leaching operations and the production of low-cost copper from material which contains as little as 0.2 percent copper.

The *Molybdenum Corporation of America* is diamond drilling a surface discovery about eight miles southeast of Coulterville in Mariposa County, California.

A joint partnership agreement has been worked out between *Aerojet-General Corporation* of Azusa, California and *Stauffer Chemical Company* of New York for the development and production of boron compounds for rocket, missile, and airplane fuels. The partnership will be known as *Stauffer-Aerojet Company* and headquarters will be in Azusa. The partnership will concentrate on research and development of suitable methods for manufacturing high-energy fuels.

The United States Air Force has awarded a $1,388,044 development study contract to *Convair* division of *General Dynamics Corporation* at San Diego, California to investigate the use of newer titanium alloys in future supersonic aircraft and missiles. The 18-month program will seek to determine the adaptability of titanium alloys to design, fabrication, and construction of future weapons systems.

Two leading boron producers have raised their prices on certain boron products. *American Potash & Chemical Corporation* at Trona, California and *U. S. Borax & Chemical Corporation* at Boron, California say that higher labor and fuel costs have necessitated the price boosts.

Kaiser Steel Corporation has completed more than two-thirds of its expansion of the steel mill at Fontana, California. Final completion date is set for the middle of this year. Ingot capacity will be increased from 1,536,000 tons to 2,933,000 tons annually. At the company's iron ore mine at Eagle Mountain, California, however, operations are being placed on a shortened work week basis as a result of reduced requirements for steelmaking operations.

Round Mountain Gold Dredging Corporation expects to start milling this month. The mill has been remodeled and has a planned capacity of 250,000 cubic yards per month. *Morrison-Knudsen* is stripping overburden at the rate of 75,000 yards per week. *Fresnillo Company* now owns all of the stock in the Nevada firm.

Kennecott Copper Corporation has deeded almost $200,000 worth of buildings, property, and equipment to various civic, religious, and fraternal organizations in McGill, Nevada. Largest single contribution was to the White Pine County School District which received title to the teachers dormitory, gymnasium, and lands at McGill valued at $174,000.

Southwest Machinery and Equipment Company of Phoenix, Arizona has purchased the cyanide plant of *Nevada State Gold Mines Company* (formerly the *Seven Troughs Gold Mines Company*) near Lovelock, Nevada and is shipping the equipment to the old *Candeleria* mine near Tonopah to treat the dumps there.

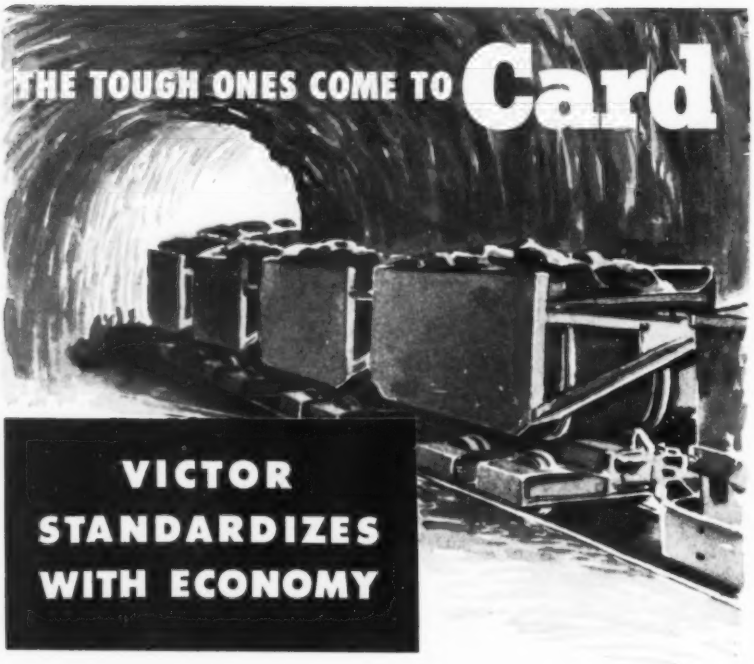
Edgemont Mining Company which is operating the old *Edgemont* gold mine in the Centennial district of Elko County, Nevada reports it has encountered the Lucky Girl vein in the Burrell adit and is now driving northeast on the vein in the hope of finding ore shoots indicated by previous work. The Edgemont is located about 40 miles northeast of Tuscarora. It has a creditable production record in gold but has been idle most of the time since 1908. Thomas C. Hedlund is manager.

Rare Metals Corporation of America is considering bids from three contractors for the shaft sinking project on its *San Mateo* property in New Mexico. Meanwhile, the company continues to test drill in order to define the limits of the ore body more definitely. Mining operations are under the supervision of Harold W. Horst, area supervisor for Rare Metals.

A new lead-zinc mine called the *Rattler* has been opened by *Sabre Mining Company* south of Lordsburg in Grants County, New Maxico. Donald L. Nett is head of the operation.

International Hoists Thirty-Millionth Ton

Operations halted temporarily at the No. 1 shaft of International Minerals & Chemical Corporation's potash mine near Carlsbad, New Mexico recently, while mine and refinery officials inspected the skip carrying the 30,000,000th ton of sylvite ore to the surface. First ore from the sylvite level, approximately 900 feet below the surface, was hoisted for processing in October, 1940. The 30,000,000 tons hoisted from the mine since would bury every inch of the 107 miles of streets in Carlsbad under a pile of ore 33 feet high. When the 40,000,000 ton mark is reached, within another month, the pile of ore could be extended 36 miles to cover the highway from Carlsbad into Artesia to the same height. In the picture above, mine superintendent M. W. Kartchner signals the hoistmen to resume work. Another potash bearing ore, langbeinite, is mined at a depth of 800 to 850 feet. All ore from all levels of the mine is hoisted through the company's No. 1 shaft, which is used only for that purpose. It is equipped with 13-ton skips and an automatically controlled hoist which has brought as much as 14,464 tons to the surface in one 24-hour period. Late in February, combined production from all levels of the mine reached the 40,000,000-ton mark, setting another milestone in the company's progress.

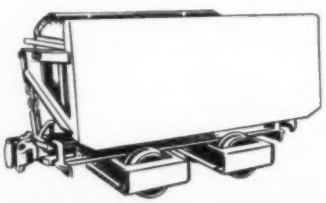


VICTOR STANDARDIZES WITH ECONOMY

The Maiden Rock Mine of Victor Chemical Works first started using Card cars in 1950. Chosen design was a Granby type car of 57 cu. ft. capacity built on 24" gauge and featuring coil spring suspension. The phosphate rock being handled is relatively clean to handle, and the car design is unusually well suited. As a result, not a single Card car has ever had any significant repairs although some wheels have been replaced. Fifty-two of these cars are now in service, representing several re-orders over a four-year period.

Much of the haulage at Maiden Rock is underground, and many of these Card cars seldom see the light of day. The steady day in, day out service record of the cars has meant high production with remarkable economy for Victor—one of the three largest producers of elemental phosphorus.

Standardize your haulage with an economical Card design. Our engineers can furnish an efficient car to meet your most difficult specifications.



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Minerals Engineering Company, which has been managing the mica mine and mill of *Petaca Mining Corporation* near Petaca, New Mexico for many months, is now purchasing scrap mica from various producers in the vicinity. The company offers to buy scrap mica in any quantity at stipulated quality delivered to the mill.

Chino Mines Division of *Kennecott Copper Corporation* has closed its 30-year-old ball casting foundry at Hurley, New Mexico. The decision was made after an extensive study proved that the division's over-all milling costs can be reduced through the use of balls purchased from outside suppliers instead of those cast at Chino. The division is also receiving new equipment for more efficient operation. Latest to arrive were seven Euclid 40-ton trucks which went into operation hauling ore at the *Santa Rita* open pit. Also in operation at Santa Rita is a new track department machine which adjusts rail ballast accurately on both sides of the track. The tailings dams are being moved south to make room for the daily tonnage of mill tailings. Five ponds will eventually be built and filled to accommodate the waste.

International Minerals & Chemical Corporation has installed a high-speed, highly accurate bag loading machine at its installations in Carlsbad, New Mexico. The machine is said to be the first complete installation of this kind in the United States. It fills a bag with 100 pounds of potash at the rate of 20 bags per minute and does this with a weight accuracy of two ounces.

The *United States Potash Company* division of *United States Borax and Chemical Corporation* has completed installation of crystallizing facilities for the production of new granular high-grade muriate of potash. Also finished is the underground development at Shaft No. 3 and construction of a surface highway from Shaft No. 3 to Shaft No. 1. At the end of the fiscal year (September 30, 1957), the company held 15,288.8 acres in New Mexico under lease from the U.S. Department of the Interior. Applications for leases on 560 acres and for 1,040 acres are still pending. Area held under lease from the State of New Mexico is 30,592.5 acres. Core drilling continues on all of this property.

The 290,000-ton *Phelps Dodge* electrolytic copper refinery in El Paso, Texas, has cut back production between five and six percent as a result of the drop in copper prices. The cut, part of an overall P-D reduction of 22 percent, will amount to about 5,000 tons of processed copper per month, according to E. W. Donahue, plant manager.

Texas Gulf Sulphur Company has surrendered its sulphur offshore leases in the Gulf of Mexico to the State of Texas. The company had obtained these in competitive bidding in 1955 because of the presence of favorably situated salt domes which had been indicated by geophysical exploration. Thorough exploratory drilling in 1957 disclosed some sulphur but failed to prove any commercial deposits.

precipitates—CENTRAL AND EASTERN

Meramec Mining Company is continuing its shaft sinking and diamond drilling programs at its *Pea Ridge* iron deposit in Missouri. The 22-foot-diameter shaft is presently being sunk to 1,500 feet, but is planned for an eventual 3,000 feet. One of the diamond drills has already gone 2,828 feet without running out of ore, and, according to company officials, they plan to drill to 4,000 feet if necessary. As previously reported in MINING WORLD (January 1958, page 77), the *Missouri Pacific Railroad* is building a spur from Mineral Point, near Potosi, to the mine site. The railroad plans to spend $3,000,000 on the track and a rail yard large enough to handle 200 freight cars carrying 10,000 tons of ore daily. The *Union Electric Company* of St. Louis is investing $1,500,000 to supply 30,000 kilowatts of power to the project.

Fansteel Metallurgical Corporation's new $6,500,000 tantalum-columbium plant at Muskogee, Oklahoma is operating at capacity as far as the production of tantalum powder is concerned, and ingot capacity is to be reached shortly. Demand for columbium metal made at the same plant has been slow because of reduced purchases by the *U. S. Atomic Energy Commission* and increased competition.

Granite City Steel Company, Republic Steel Corporation, and *Tennessee Products* have resumed purchasing of iron ore from the more than 25 miles in the West Plains, Missouri area. A temporary "stop shipment" order went out to mining companies in December, but it has apparently been rescinded.

National Lead Company's St. Louis Smelting and Refining Division has suspended operations indefinitely at the *Ballard* mine and mill two miles west of Baxter Springs, Kansas. The "depressed ore market" was cited as the main cause for the shutdown. Unstable market conditions had made profitable operation more and more difficult. The mine went into operation in the early 1930's and, at one time, was one of the most productive lead and zinc properties in the Tri-State district.

Blackwell Zinc Company, a subsidiary of *American Metal Climax Inc.*, has reduced operations at its plant in Blackwell, Oklahoma. It is now operating 10 furnaces instead of 14. One closed in January and three others in late February. The current reduction amounts to about 2,000 tons of slab zinc per month. In 1957, Blackwell Zinc Company produced about 88,000 tons of refined slab zinc, equal to about eight percent of the total U. S. smelter output.

Mackey-Humm Fluorspar Company and *Hicks Creek Fluorspar Mining Company* have been sold and are now operating as *Southern Illinois Mining Company* of Rosiclare, Illinois. Mackey-Humm operated *Humm's Wye* mine and mill at Golconda, while Hicks operated the *Douglas* mine.

International Minerals & Chemical Corporation of Chicago, Illinois has set up a mining and exploration department as a separate function. According to T. M. Ware, president, this recognizes the need to perpetuate the successes the firm has had in the minerals field, improves coordination, and facilitates entry into new mineral ventures that are continually coming to the attention of the company.

Knoxville Sand & Gravel Company, a wholly owned subsidiary of the *American Zinc Company,* has acquired the physical properties owned and controlled by *Knoxville Sangravel Material Company* of Knoxville, Tennessee. The purchase includes two heavy-duty dredges for excavating sand and gravel in the Tennessee River, two tow boats, Diesel-equipped, and other auxiliary equipment which has a capacity to recover substantial tonnages of river sand and gravel. The crushing, screening, and classifying plant is located at Knoxville, Tennessee. Dredging permits cover a total of 162 miles of dredging area, all on Tennessee River or its tributaries.

H. B. Windsor has opened an agricultural limestone crushing business near West Plains, Missouri where he is leasing a quarry from Earl Hergesheimer. The firm will produce crushed agricultural limestone, road chat, and concrete rock.

Haile Mines Inc. has taken another step in its program of diversification by acquiring the *National Paint & Manganese Company* of Lynchburg, Virginia. Its principal business is the production of ground manganese ores which are sold almost entirely to the brick industry as a coloring agent. National Paint will operate as a division of Haile. Haile and its subsidiaries, *Tungsten Mining Corporation* and *Manganese Inc.*, are producers of tungsten and manganese ores.

Isotopes – Industrial Use of the Atom

The brightest spot in the uranium field is the rapid and steady growth in the use of radioisotopes in industry. More than 900 different kinds of isotopes (radioactive atoms) of the 102 known elements have been produced—most of them in nuclear reactors fueled with uranium. The Atomic Energy Commission's Oak Ridge National Laboratory at Oak Ridge, Tennessee is the largest supplier.

Isotopes look like regular elements and have the same chemical properties, but each differs in the number of neutrons contained in the nuclei. Unstable isotopes emit energy in the form of particles or rays and are then known as isotopes.

Dr. Willard F. Libbey, AEC Commissioner, has predicted that by 1962 industry will save $5,000,000,000 annually by the use of isotopes; a 10-fold increase over present use.

Isotope radiation is used to measure and automatically control the thickness of various metals, plastics, rubber and coatings of many types, as well as the density of cigarettes. It's used for sorting various materials, monitoring the contents of packages, weighing molten slag, inspecting metal parts for flaws.

Since a radioisotope, through its radiation emissions, continuously "broadcasts" its whereabouts, it can be used as a sensitive tracer in following and untangling intricate chemical processes. This also makes radioisotopes invaluable for such purposes as detecting leaks, indicating the rate of gas or liquid flow, measuring tool or engine wear, and determining the amount of fertilizer absorbed by plants.

The table on isotope prices, uses, and costs has been prepared by the National Industrial Conference Board. The mining and metallurgical industries are well represented under typical uses for density gauging, liquid level gauging, radiographic inspection, and detecting leaks in pipe lines.

Remember that AEC licenses are required for all but a few uses for radioisotopes. Full information can be obtained from the AEC's Isotopes Branch, Division of Civilian Application, Washington 25, D. C.

Isotopes, Their Prices and Typical Uses

Isotope	*Cost*	*Typical Uses*
Carbon 14	$28 a mc for shipments through 199 mc. $22 a mc for larger shipments.	Studying the process of photosynthesis. Studying combustion of motor oils.
Cesium 137	10 cents a mc for first curie. $25 each curie or fraction thereof, 1 to 500 curies. $10 each curie over 500 curies.	Density gauging. Liquid level gauging. Radiographic inspection.
Cobalt 60	$2 a curie, 1-10 curies. $3 a curie, 11-25 curies. $4 a curie, 26-40 curies. $5 a curie, over 40 curies, with discounts of 15 to 30 per cent for purchases over 5,000 curies.	Radiographic inspection, studying effects of gamma irradiation on materials; liquid level gauging; routine assay of vitamin B12.
Iodine 131	50 cents a mc through 499 curies. 40 cents a mc over 499 curies.	Detecting leaks in closed pipelines.
Iridium 192	$15 a curie, first two curies or fraction thereof; $2 a curie thereafter.	Radiographic inspection
Phosphorous 32	$110 a mc for shipments through 249 mc. $1 a mc for those over 249 mc.	Investigating fertilizer placement and uptake.
Strontium 90	50 cents a mc.	Thickness gauging; luminous markers for helicopter escape hatches.

The abbreviation "mc" represents millicurie, or one-thousandth of a curie. A curie is a unit of radioactivity approximately equal to that of one gram of radium.

Kilmichael Ore Corporation has been organized by local residents to mine for iron ore in Mississippi. The firm has leased a large area, chiefly in Choctaw, Montgomery, and Webster counties, and has set up a crusher and washer in southwestern Webster. Open-pit mining is reported to be underway.

The domestic mining industry produced 1,649,013 tons of aluminum in 1957, as compared with 1,679,247 tons in 1957. This made it the second highest annual ouput in the industry's history. *Reynolds Metals Company* has brought the first of three new potlines into production at the new Listerhill, Alabama aluminum reduction plant. The other two lines are scheduled for operation in the spring and summer. The three will have a combined capacity of 112,500 tons of aluminum annually, thereby increasing Listerhill's primary production potential to 190,000 tons, and the total for the company to 601,000 tons. A large part of the production from the new plant will be used by the *Ford Motor Company* which has recently constructed a foundry adjacent to Listerhill. Meanwhile, *Aluminum Company of America* has decided to suspend construction work on three expansion projects. These include the company's new Warrick plant near Evansville, Indiana; a seventh potline at Point Comfort, Texas; and a new alumina refining plant at Point Comfort. Completion of the suspended work would have added another 170,000 tons. Smelting cutbacks have also been made at Vancouver and Wenatchee, Washington, and Massena, New York (because of power shortages); at Alcoa, Tennessee, where three of eleven units have closed; and at Point Comfort, Texas, where one of six units has closed. *Kaiser Aluminum & Chemical Corporation* has reduced output at its Mead, Washington plant by 44,000 tons annually.

The special stockpile advisory committee, appointed to review the government's current stockpiling policies and programs, has recommended that emphasis in stockpiling be shifted from raw materials to finished items and vital supplies needed for survival, relief, and rehabilitation.

American Zinc Company of Tennessee has stopped production at its *Grasselli* mine at New Market, Jefferson County, Tennessee. Grasselli is the first mine in this lead-free zinc district to be closed down because of high operating cost.

The *St. Joseph Lead Company* reports that its smelter at Josephtown, Pennsylvania has a capacity of 12,000 tons of slab zinc per month, but that the plant is presently operating at a rate of only 9,500 tons a month because of the depressed conditions in the zinc market. *American Zinc, Lead & Smelting Company* expects production of slab zinc in the first quarter of 1958 to be down 25 percent below the corresponding period of last year. Tonnagewise this is about 10,000 tons of zinc. To alleviate this situation, world-wide zinc and lead industry interests, together with those in the United States, are undertaking a broad program of expanded research activities to stimulate more uses for these metals: American Zinc Institute, as representative for the zinc industry, reveals that a staff is now being formed to supervise the program expansion. Next step will be the broad placement of zinc and lead research development projects in research centers, universities, and engineering schools. Foreign, as well as domestic producers, will help finance the program.

The *U. S. Atomic Energy Commission* has decided to shut down the Model City, New York boron-10 plant which is operated for the commission by *Hooker Electrochemical Company*. The decision was made after a study showed that the current inventory is sufficient for the demand for boron-10 for the next several years. The commission will keep the plant on a standby basis so that it could be reopened at a future time. It will be closed by July 1, 1958, on a gradual basis to minimize the reemployment problem.

E. I. du Pont de Nemours & Company has taken over the actual operations of its *Trail Ridge* and *Highland* ilmenite plants in Florida from *Humphreys Gold Corporation*. The change was made because du Pont believed that a closer integration with other company operations was necessary for economic reasons.

The city of Bartow, Florida has approved an amended ordinance governing mining within the city limits. Although an ordinance permitting mining was adopted by the city commission several years ago, the rules were never written. Among the provisions now established before receiving a mining permit is this condition: land must be restored to condition satisfactory for use as building sites. Only the northeast and northwest corners of the city are zoned for mining purposes.

A *U. S. Bureau of Mines* survey of the total resources of *National Lead Company's* operation in Essex County, New York set reserves at 121,500,000 tons of titanium-bearing ore. About 100,000,000 tons of the total resources can be developed by present-day ore dressing techniques. In the Lake Sanford area of the county about 23,960,000 tons were estimated containing titanium oxide. The National Lead operation now produces ore with about 18 to 20 percent titanium oxide and 34 percent iron at the *McIntyre* operation at Tahawus. The McIntyre deposit, along with the new deposit found two years ago, contains 100,000,000 tons of titaniferous material of 20 percent titanium oxide. At Calamity Mill pond nearby, the 9,500,000-ton deposit contains 17.2 percent titanium oxide, and at *Iron Mountain* the 12,000,000-ton deposit contains about 19.4 percent titanium oxide. Small deposits of magnetite and ilmenite near Elizabethtown, Mineville, and Westport were not considered mineable under economic and technological conditions of 1955. (The report's statistics indicated the survey had been completed with 1955 figures which were the latest available.)

Republic Steel Corporation has cut operations to a four-day week at the concentrating mill and sintering plant at Port Henry, New York because of iron ore inventory build-up. Three mines at nearby Mineville, New York were not affected.

Recommended safety standards for sinking mine shafts have been issued by the *U. S. Bureau of Mines* to curb explosions, fires, and other accidents during shaft sinking operations. In compiling the standards, applicable state rules were

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considered and included, and representatives of the mineral industries, coal and noncoal, were consulted. Made available in a Bureau publication, the standards are grouped under a dozen main headings: Fire prevention; fire protection; housekeeping, illumination and sanitation; electricity; explosives storage and transportation; timbering and safeguarding personnel and equipment; hoisting, hauling, and handling excavated material; ventilation; drilling; blasting; welding and burning; and lighting. An appendix discusses equipment that should be available for fighting the three types of fire likely to be encountered during shaft-sinking activities. A copy of the publication, I. C. 7810, "Recommended Safety Standards for Shaft Sinking," can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

IRON RANGES

Jones & Laughlin Steel Corporation has purchased 300 additional acres of Wisconsin land and has taken lease on 1,720 other acres. These acquisitions followed successful drilling for iron ore in the vicinity of Butternut, Wisconsin. Further research will be conducted on the method of treating these ores for desirable concentrates.

During the winter months, *Snyder Mining Company* has been stripping two of its properties—the *Whiteside* iron mine near Buhl, Minnesota, and the *Webb* near Hibbing. Stockpiling of iron ore is underway at the *Godfrey* underground mine.

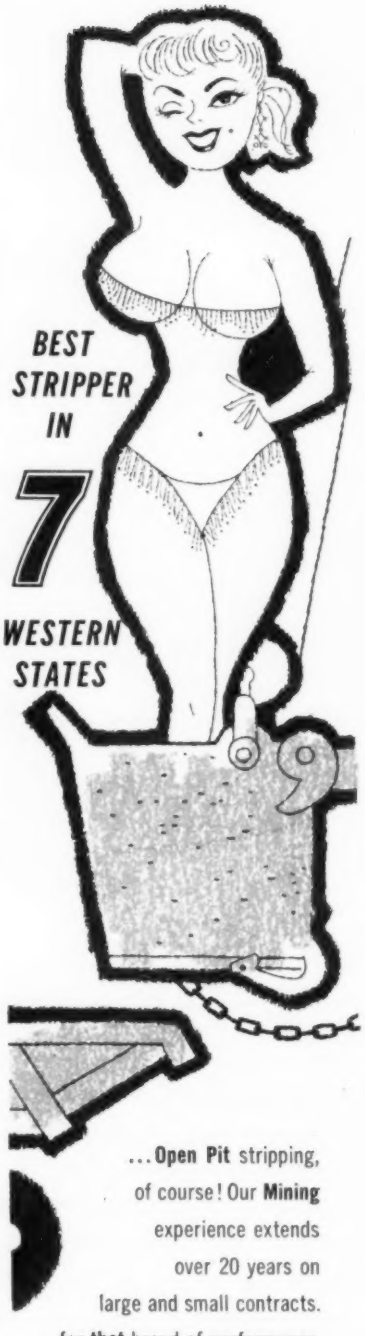
Forecasts for the 1958 iron ore season point to an ore shipment total of about 75,000,000 tons, as compared with 84,500,000 tons in 1957. Heavier-than-usual inventories are part of the reason for the lower estimate.

Oliver Iron Mining Division of *U. S. Steel Corporation* shipped 35,000,000 tons of iron ore from its properties on the Mesabi Range during 1957. The company also moved 65,000,000 tons of waste to the dumps during that period.

Erie Mining Company's facilities at Taconite Harbor, Minnesota not only served as an ore loading dock during 1957, but also as a coal unloading dock. The first coal transported to Taconite Harbor arrived on June 16 and the coal unloading tower with stockpiling facilities was put into service. A total of 30 coal cargoes totaling over 300,000 tons were unloaded during 1957 and used for heating facilities at their operations.

Marquette Iron Mining Company has completed its present program of diamond drilling on the low-grade *Empire* iron property at Palmer, Michigan, six miles south of Negaunee. The Empire is a future source of low-grade ore for Marquette's Eagle Mill.

Pacific Isle Mining Company has been engaged in limited stripping operations on the Mesabi Range since the close of the shipping season. This work has been carried on at the *Chataco, Iroquois, Mill,* and *Meadow* mine properties. Limited exploration is also underway, in addition to regular winter maintenance and repair work.



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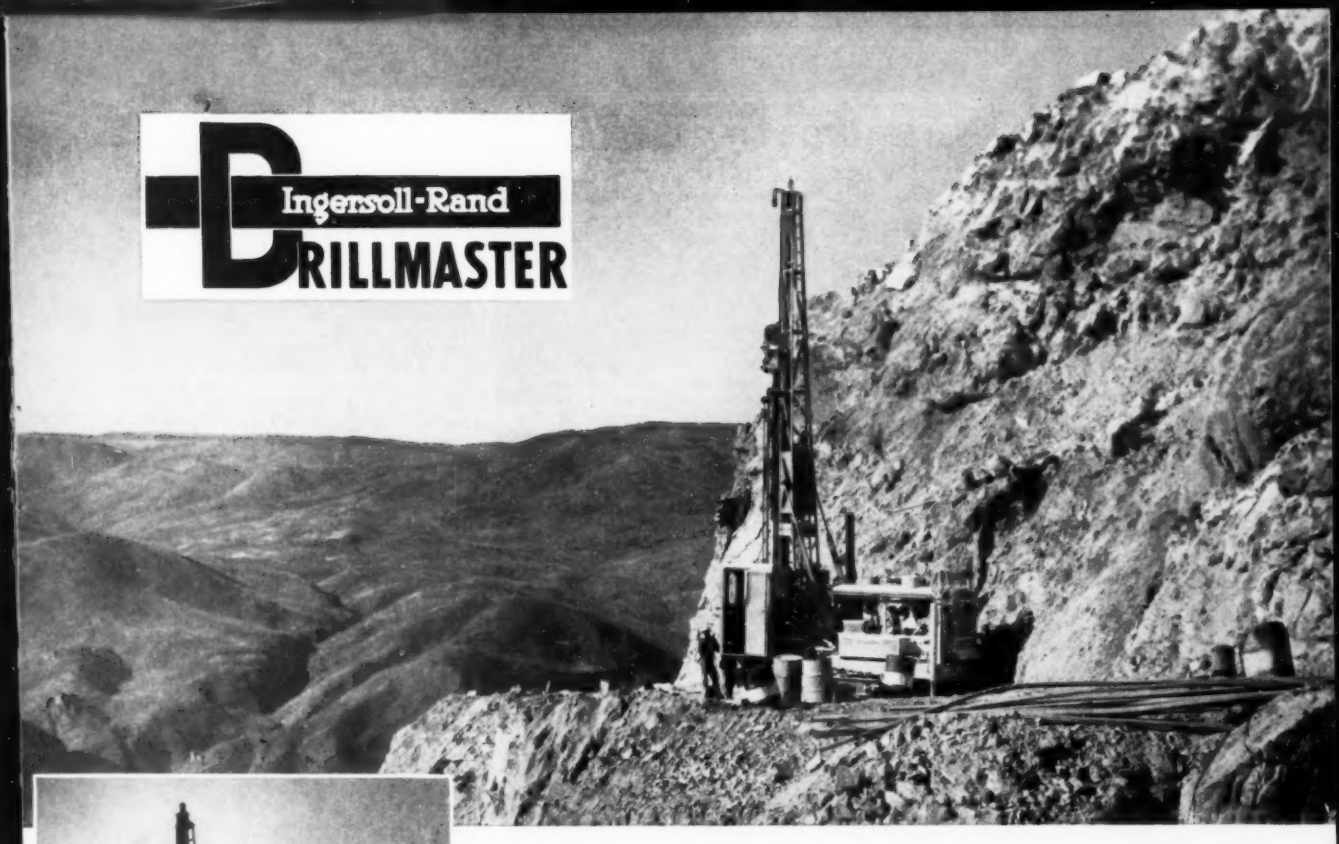

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High-grade silver ore has been opened for more than 120 feet of the "09" vein in the *Sunshine* mine, Shoshone County, Idaho, at a depth of 3,700 feet and is being followed into the New Purim area under an operating agreement with *Polaris* and *Silver Dollar* mining companies. Core drilling on the 3,850-foot level showed high-grade over a good width. Drifting toward the vein is underway on the 3,550 and 4,000 levels. The vein lies 300 feet into the hanging wall of the Chester vein in the Omega area of the Sunshine mine. It is called the most encouraging ore development in recent years.

High-grade silver-copper ore showings five and four feet wide have been intersected in property of *Rainbow Mining & Milling Company*, Shoshone County, Idaho. The diamond drill cores were obtained at distances of 560 and 621 feet south of the east-west lateral which *Polaris Mining Company* has been driving through the property at a depth of 3,000 feet for exploration purposes. A north-south striking ore shoot previously opened off the lateral has yielded ore in a raise for more than 200 feet. Rainbow is controlled by *Coeur d'Alene Mines Corporation*.

Black Bear Silver-Lead Mines has located what it believes is the easterly extension of a vein mined in the *Haywire* lease to the west. The vein is in the *Grover Cleveland* claim recently leased from *American Smelting and Refining Company*. Track and pipe lines have been laid to new ore faces. *Metropolitan Mines Corporation*, Wallace, is financing the work at the property near Gem, Shoshone County, Idaho, in exchange for stock control.

Miners probing for the downward extension of the famed *Senator Stewart* mine silver-lead ore body near Kellogg, Shoshone County, Idaho, at last report had entered the area of anticipation. The property is owned by *Silver Bowl, Inc.*, Kellogg, and the work is being done by the *Bunker Hill Company* from its mine workings in return for a 75 percent interest in certain sections and 50 percent in others. A body of high-grade was found in Bunker Hill's *Ontario* area en route to the Senator Stewart.

Directors of *Vulcan Silver-Lead Corporation*, owner of the *Galena* mine (Shoshone County, Idaho), have voted to merge with the parent firm, *Callahan Zinc-Lead Company*, on a 1-for-1 share basis. Joseph T. Hall, New York, is president of both companies.

The downward extensions of two ore shoots have been opened on the new bottom 700-foot level of the *Conjecture* mine in Bonner County, Idaho's Lakeview area and they showed improved length, width, and grade. Values are mostly in silver and lead. In the *Silver Leaf* group of claims held by *Conjecture Mines, Inc.*, an exploratory drill hole penetrated a vein of high-grade silver ore 45 feet into the wall of the main adit. Work was done by *Federal Uranium Corporation* under a profit-sharing arrangement. Federal spent $300,000 in its first year of operations. R. W. Neyman, Salt Lake City, is president of Federal Uranium and Donald E. Majer, Spokane, heads Conjecture.

"Super purity antimony" (99.995+ percent Sb) now is being produced on a pilot plant scale by the *Bunker Hill Company* at Kellogg, Shoshone County, Idaho, under a process developed by the firm's smelter research department. Most of the output is going to the electronics industry for transistors and semiconductors. Minor changes in feed chute design at the zinc plant electric furnace permit melting of an additional 100,000 pounds of zinc cathode daily. Bunker Hill has curtailed production and capital improvements because of low lead and zinc prices. A four-day week has been announced for the *Bunker Hill, Crescent,* and *Star* mines, and also for the concentrator, sawmill, and supporting mine activities. Operations at the lead smelter and refinery and electrolytic zinc plant remain unchanged for the present.

Silver Star-Queens Mines, Inc. is rehabilitating the footwall winze on the Queens vein at its Blaine County, Idaho mine preparatory to deepening the shaft from the 750 level to the 900 level. Ore shipments in 1957 totaled more than 4,500 tons valued at $195,000. The company has been working 23 men on a three-shift basis. Roy T. Fitz is manager and Garfield Voget, president.

Jack Waite Mining Company has reduced the par value of its capital stock from $1.00 to 20 cents a share, creating 1,500,000 additional shares which management plans to use in acquiring other properties. The *Jack Waite* lead-silver mine on the Idaho-Montana border east of the Coeur d'Alene mining district in Idaho is operated by *American Smelting and Refining Company*.

Ray W. Paulson of Lewiston, Idaho has leased 80 acres of state land for placer gold. J. R. Randall of Kamiah has leased 120 acres for quartz-asbestos.

The *Livingston* mine property in Custer County, Idaho, which *Hecla Mining Company* is exploring under an agreement with *Idaho Custer Silver-Lead Mines*, has been closed down for the winter months, and will be reopened in the spring as soon as conditions permit. Before the winter shutdown, the shaft had been completed to its objective, the 2,750 level, and the shaft station and pocket cut. Diamond drilling from the 2500 level has revealed encouraging mineralization.

Exploration of a copper deposit at the *Dailey* copper mine, Jefferson County, Montana, is planned by *Uranium Corporation of America*, a Montana firm, under a contract approved by the Defense Minerals Exploration Administration. Government participation will be 50 percent, or $42,586. O. W. Sorensen is executive vice president of the firm which has its headquarters in Portland, Oregon.

The *Anaconda Company* at Anaconda, Montana is constructing a pilot plant to recover alumina from clays mined on company-leased ground near Deary, Idaho. 7,500 tons of clay have been stockpiled for testing and about 2,500 additional tons of the clay are scheduled to be mined soon and shipped to the pilot plant. The company has announced that a multi-million dollar plant may be built in the Moscow, Idaho area if the pilot plant operation is successful.

Minerals Engineering Company's tungsten mill at Glen, Beaverhead County, Montana, now is processing manganese ore and at last report was handling 200 tons daily. The ore is supplied by *Sodak Mining Company* from property 14 miles distant from the mill. Minerals Engineering is milling the ore as its part of a joint venture. The tungsten mill was closed last September when the price of tungsten dropped below cost of production. The $1,500,000 plant had 90 men on its payroll.

Anaconda Company is reported to have leased the old *Flathead* silver mine 30 miles southwest of Kalispell, Montana to Lloyd Byrnie of East Lake Shore for three years. The lease becomes effective in three months if Mr. Byrnie finds ore in paying quantities. The Flathead mine was discovered some 40 years ago, and at one time employed 65 men. It was shut down 12 years ago after 20 years of intermittent operation.

South Dakota Uranium and Mining Company of Hot Springs, South Dakota is producing manganese ore from Montana state lands in Beaverhead County. This is the only manganese produced on state land in Montana. The mine is located near Glen, and production is expected to be increased to 100 tons of ore mined per day.

The Department of Mining Engineering at *Montana School of Mines*, actively assisted by the Mining Association of Montana, the *Anaconda Company*, American Institute of Mining, Metallurgical and Petroleum Engineers, the Montana Society of Engineers, and the Montana School of Mines, will sponsor a symposium concerned with the hydraulic emplacement of mine stope fill. The symposium will be held on the campus of the School of Mines at Butte on May 9 and 10. There will be sessions covering such aspects as the use and application of hydraulic fill in which the modification to mining methods that result from the use of this technique will be described; the use of hydraulic fill for fighting mine fires and as a stabilizing factor providing regional support to ground adjacent to active mines; the problems associated with conditioning sand and tailings for the most efficient transportation, placement, and drainage of the fill after it is in place; and results of the most recent research into the design aspects of sand fill systems. Industry representatives from Canada and all over the United States will attend.

Treasure State Uranium Company's trial runs at the *Brooklyn* mine near Maxville, Montana have proved encouraging. A large decomposed igneous dike is being mined by underground hydraulic methods. The ore, after being broken out of place by a high-pressure jet of water, is carried as a slurry in a six-inch pipe line to a mill located about one mile away. Cold weather has halted operations, but the trial runs have shown that the system may be successful.

Capitol-Seaboard Corporation is reported to have taken an option from *K. D. Brown Enterprises* on a 17-claim iron deposit in Montana. The deposit is said to

be a vein, ranging from 125 to 225 feet wide. The iron is magnetite and averages about 35 percent across the entire width of the outcrop.

OREGON

The *Arentz-Comstock Mining Venture* is planning expansion of processing facilities at its *Bretz* mercury mine in Malheur County, Oregon. By the addition of wet screening, which will automatically eliminate the bulk of the opalite mineral after crushing, more low grade ore can be run through the 150-ton flotation plant with a probable 75 percent increase in ore feed.

Promising uranium discoveries have been made on the *Pike Creek* properties of *Solar-X Corporation* in the Steens Mountains of Harney County, Oregon. Dr. W. P. Johnston, Reno mining geologist, reported good assays from surface samples. Kenneth Arnold is president.

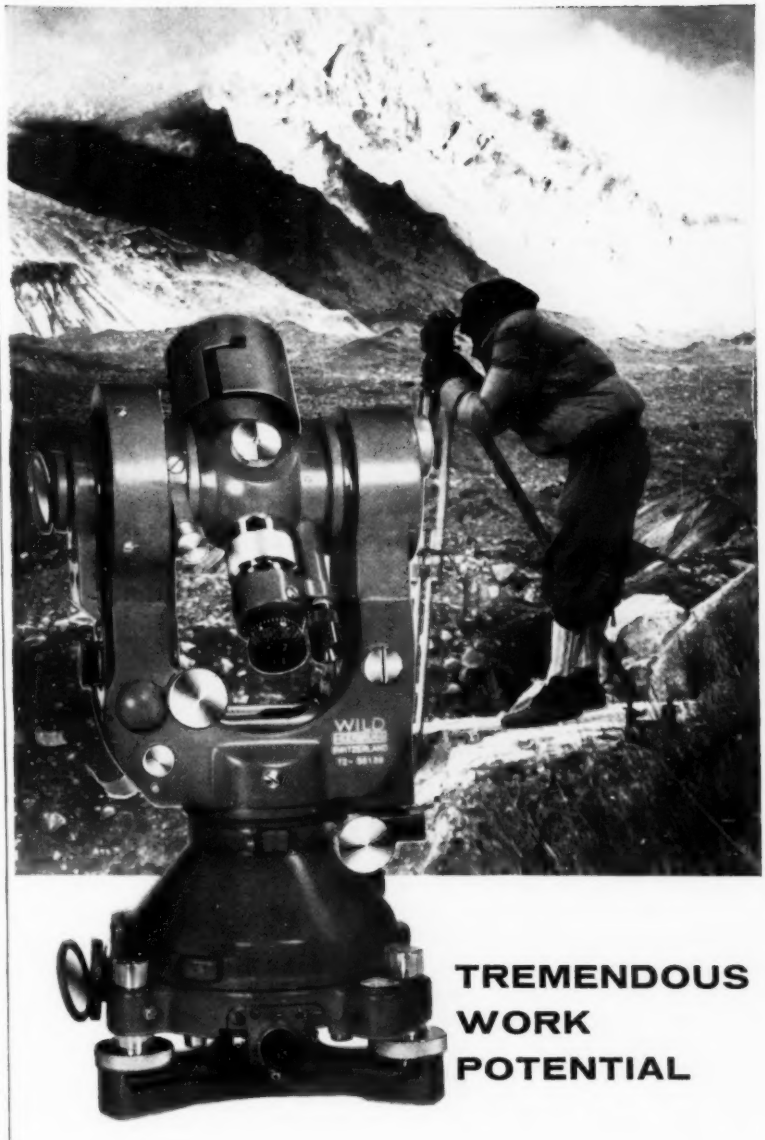
Galigher Company of Salt Lake City has been selected to engineer and design *Lakeview Mining Company's* proposed $2,600,000 uranium processing plant near Lakeview, Oregon. Construction is expected to get underway this spring. The company has also exercised its option to purchase a 257-acre tract north of Lakeview from the *Fremont Lumber Company* for a mill site.

International Engineering and Mining Company of Santa Barbara, California has started the first phase of exploration at its *Axehandle* mercury mine near Ashwood, Oregon. The firm has a $10,420 DMEA contract for the work. The property was successfully mined by the Swanson family and prior to 1944 produced 800 flasks of mercury. Ore was mined from six different locations on the property, from original ground elevation to minus 75 feet maximum depth, and has not been explored or drilled beyond these specified areas or depths. Trenching and subsurface geology by the new operators indicate a high potential open pit operation.

The *Raw Materials Survey* of Portland, Oregon has revised its report on the Silica Resources of the Pacific Northwest. This is the second revision since the report was published in 1946. Data on 22 deposits in Oregon, Washington, Idaho, Montana, and British Columbia are listed. Copies may be obtained at $3 each by writing to the Raw Materials Survey, 824 S. W. Fifth Avenue in Portland.

The *Chloride* mine in the Rock Creek district of Baker County, Oregon has been leased by the *Circle Star Mining Company*. A 35-ton flotation mill has been erected on the site. The ore reportedly is gold, silver, lead, zinc, and copper. Circle Star is a partnership composed of Loren Stanciu, Roy Pickler, Clyde Smart, and Dave Aeder, all of Haines, Oregon.

The *United States Geological Survey* has released nine aeromagnetic profiles of western Oregon covering one north-south section along the coast from Florence to Seaside, and eight east-west sections from the coast to the Cascade foothills. Information about these profiles may be obtained from the *State of Oregon Department of Geology and Mineral Industries*, 1069 State Office Building, Portland 1,



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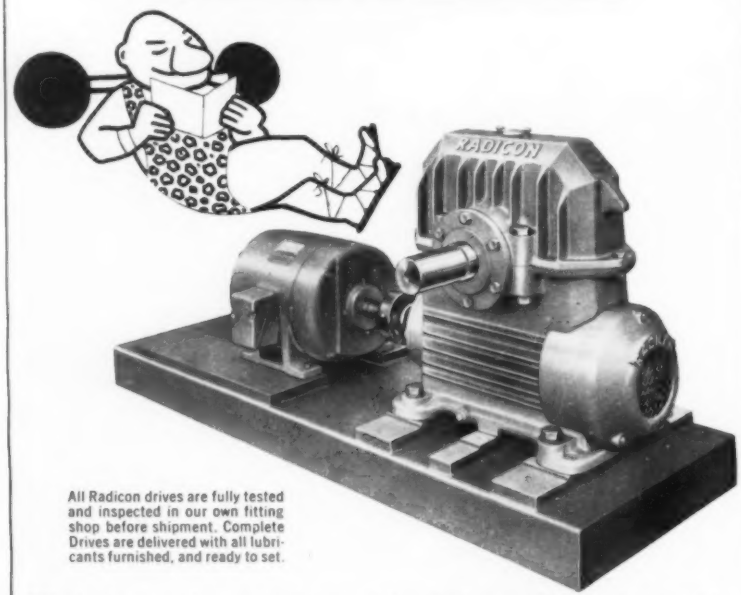

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Oregon, or the U.S. Geological Survey office at 4 Homewood Place, Menlo Park, California.

The old *Last Chance* mine in Stevens County's Northport mining district, Washington, has been rehabilitated by *Basic Minerals, Ltd.* of Regina, Saskatchewan. A flotation mill on the property was remodeled and equipped with new machinery. Surface bulldozing uncovered a vein of rich lead-silver-zinc ore. The Canadian concern, organized by *Pan-American Investments, Ltd.* of Regina, employed 25 men last season and spent a reported $100,000 at the property.

Underground mining is replacing open-pit mining at the Spokane County, Washington *Dahl* lease operation of *Daybreak Uranium, Inc.* The principal ore zone, 30 feet wide, is to be stoped downward on a 15-degree slope. The heading will be 10 feet high to accommodate mechanical mining and loading equipment. The firm has moved an estimated 75,000 tons of material in more than 18 months of open-pit work and shipped 12,000 tons of uranium ore.

Geo-Resource Corporation is planning 50 hours of bulldozing and 700 feet of diamond drilling under an $8,014 extension of its original $45,690 DMEA contract for uranium exploration just north of the Spokane Indian Reservation, southern Stevens County, Washington. The firm has leased additional ground in the area—13 mining claims from E. G. Bond and Associates of Spokane—for exploration this year. The company also has come out with a public stock offering of 1,157,700 shares designed to raise $272,483.

A new flow sheet developed by *Western Gold Mining, Inc.* at Barron, Whatcom County, Washington, in test runs reportedly has decreased milling costs and quadrupled mill capacity. Hard slate inclusions have been screened out of the gold-bearing breccia by substituting vibrating screens for a classifier. Two-stage crushing is to a minimum of ⅜-inch, grinding in closed circuit with vibrating screen, flotation in a new 4-cell No. 18 sp. Denver flotation machine and dewatering of flotation concentrate by vacuum filter. New equipment purchased in 1957 included two Atlas Copco "Lion" pusher leg drills, Sandvik Coromant drill steel and rods, a Worthington compressor, a two-drum slusher hoist, three one-ton ore cars, an air-powered bit sharpener, 1,800 feet of 20-pound steel rail, an Eimco loader, and a Gardner Denver loader. Work included construction of a new 1½-mile road to give better truck access from mill to upper mine levels. Harry P. Kramer of Seattle is president.

Spokane Mountain Uranium Company has been incorporated with $300,000 capitalization by Al R. Perri and Harry T. Phillips of Lewiston, Idaho, and Vade Spencer, Cottonwood, Idaho.

Inland Empire Mining Company plans to install a portable upgrading mill on its manganese property near Port Angeles, Washington. Leaching equipment then would be added as soon as production

warrants. The company has leased a number of claims in the area, including the *Little River* from E. N. and James Fitzgerald, the *St. Regis* claims from Perry C. Garrett, and the *Ed B* claims from Norman Brooks, Mrs. Nora Raymond, and Max Church. The firm has also purchased a one-third interest in the *Bear Creek* and *Victory* claims. E. R. Gehrke has been elected the new president.

The 1958 Pacific Northwest Regional Conference will be held at the Davenport Hotel in Spokane on April 17, 18, and 19. It is sponsored by the Oregon, Columbia, and North Pacific sections of the *American Institute of Mining, Metallurgical, and Petroleum Engineers.*

Timber Beast Mining Company of Prospect, Washington has received Defense Minerals Exploration Administration approval of a $24,772 uranium exploration project in Harney County. Government participation will be 75 percent. Work will consist of drifting. The firm was organized by the partnership of W. C. Teegarden, Charles Skeeters, Glenn Young, and George Slade.

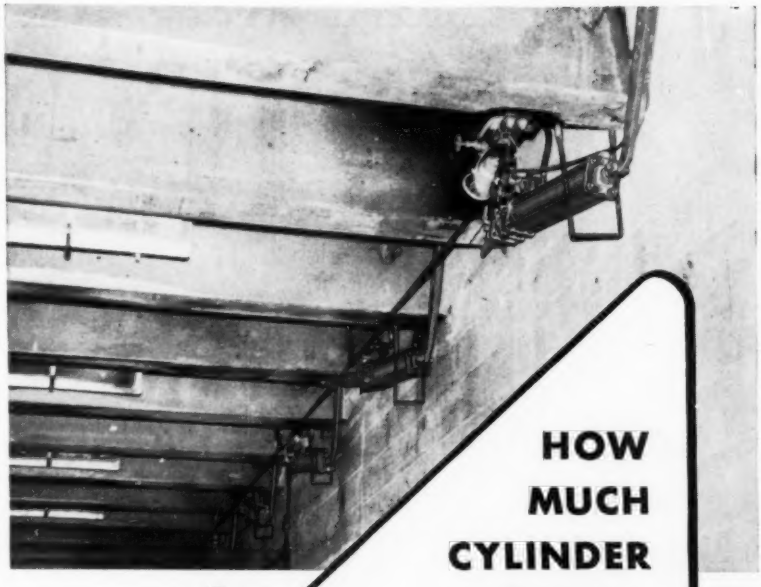
The *Red Top* lead-silver-zinc mine north of Leadpoint, Stevens County, is being operated by *Bonanza Consolidated Mining Company* under a lease and purchase option with *Red Top Mining Company.* At last report eight men were employed and a snowplow was being used to keep the mine road open. Several hundred tons of ore had been trucked to the Bonanza flotation mill just north of Colville. The ore was taken from a new strike made beyond a dike in a raise at the 880-foot point in the 1,200-foot Red Top tunnel. Operating plans include tunneling under another ore discovery made in an inclined shaft by the late A. C. Neiman of Northport who was killed by a dynamite blast while opening the ore body. The Bonanza firm installed a new air compressor, ventilating pipe, new track and other equipment after taking over. Earle B. Gibbs of Colville heads the firm.

Silico Company of Wenatchee, Washington has staked and recorded two mining claims in the Colville mining district of Stevens County.

Mill construction at the Pend Oreille County lead-zinc-silver property of *Utahcan, Inc.* in Washington was continuing in several feet of snow, at last report. A 10-man crew had completed 300-ton coarse and fine-ore storage bunkers and a crusher house and were putting up the ball mill structure. The property is in the Jim Creek district at an elevation of about 4,500 feet. Roy Lorang, Spokane, is president.

Low metal prices have brought about a reduction of mining operations from a six-day to a five-day week at the Metaline District, Pend Oreille County property of *Pend Oreille Mines and Metals Company,* Washington's largest zinc-lead producer still operating. Two hundred men were affected. They had been producing about 2,800 tons of ore daily.

Western Gold Mining, Inc. is planning to start milling ore at its *New Light* mine in Whatcom County, Washington this spring. During the past season, additional machinery was installed to increase mill capacity to 150 tons daily. Some ore also was blocked. The crew numbered 15. Harry P. Kramer of Seattle is president.



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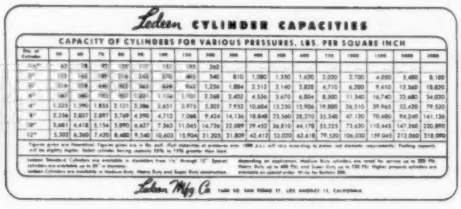
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2"	155	185	189	216	243	275	403	540	810	1,080	1,350	1,620	2,020	2,700	4,050	5,400	8,100		
3"	324	378	486	502	561	648	960	1,256	1,884	2,512	3,140	3,828	4,710	6,280	9,420	12,560	18,820		
4"	567	680	765	907	1,021	1,156	1,701	2,268	3,402	4,536	5,670	6,804	8,500	11,340	16,740	22,680	34,020		
5"	1,225	1,390	1,835	2,121	2,306	2,631	3,975	5,303	7,952	10,604	13,250	15,906	19,880	26,510	39,965	53,420	79,520		
6"	2,256	2,827	2,897	3,769	4,290	4,712	7,068	9,424	14,136	18,848	23,560	28,270	35,340	47,120	70,680	94,240	141,136		
10"	3,681	4,418	5,154	5,890	6,627	7,363	11,045	14,726	22,089	29,452	36,810	44,178	55,225	73,630	110,445	147,260	220,890		
12"	5,302	6,360	7,420	8,480	9,540	10,603	15,904	21,205	31,809	42,412	53,020	63,618	79,520	106,030	159,045	212,060	318,090		

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Utex Varies Interests With Mexican Projects

Utex Exploration Company of Moab, Utah, one of the nation's principal uranium producers, is diversifying its operations with projects in Mexico. It now operates a manganese mine in Queretaro, and a lead-zinc property in Comitan near the Guatemalan border. John F. Haynes, Utex geologist with headquarters in El Paso, Texas, is supervisor of both operations.

Climax To Sink Vertical Shaft for New Levels

Climax Molybdenum Company, a division of American Metal Climax Inc., will shortly undertake the sinking of one of the largest shafts in the western part of the United States. The 700-foot circular shaft, whiich well be 19 feet in diameter, will be the first vertical shaft sunk by Climax since 1933. Its Climax mine in Colorado has been developed mostly through horizontal drifting.

Purpose of the No. 4 shaft is to permit development of a new production level 300 feet beneath the Storke Level and to allow access to another level 600 feet below the Storke which will be explored. It will be sunk from the Storke Level at a point more than a mile into the mountain from the Storke Portal. Completion date is set for the end of the year.

There will be four main compartments in the shaft—two for skipways, one service cage, and a manway. The two skips will operate in balance, each having a capacity of 80 cubic feet or four tons. When in operation, they will have a combined capacity of at least 1,000 tons of muck in each 8-hour shift. The service cage will be about 9 feet wide by 18½ feet long. It will accommodate a 13-ton mine locomotive, and, with the cage removed, could handle a 20-ton locomotive which could be raised or lowered to the new production level.

Almost completed are the cableways, a 350-ton ore bin, headframe, and hoist room. The headframe will be 113 feet above the collar, and actually is a continuation of the shaft itself. The hoist room is carved out of solid rock. It will contain one single drum hoist for the service cage, and a double drum for the ore skips, and for sinking operations.

templating a float sink plant for upgrading ore at the Garry-Owen, and installation of additional equipment to enlarge the zinc circuit in the Shenandoah mill in Silverton.

Denver-Golden Oil & Uranium Company is sinking a winze below the Charlie Tunnel in its *Schwartzwalder* mine eight miles north of Golden, Colorado. Shipments during the last two months of 1957 averaged better than 1.0 percent U_3O_8.

Trace Elements Division of *Union Carbide Nuclear Corporation* is completing test runs to bring its 300-ton uranium plant to maximum capacity at Maybell, Colorado. The mill will treat ore from the *Marge*, *Mayflower*, *Babs*, and *Bessie* claims.

Vanadium Corporation of America has closed its uranium processing plant at Naturita, Colorado, apparently because it cannot compete with newer and larger mills at current AEC prices for concentrates. It is expected that the plant will continue to be used as an AEC ore buying depot and sampler plant. It has also been reported, but not confirmed, that VCA might revamp the facilities for use as an upgrading plant, which would lower costs of ore shipments to Durango, Colorado.

The first big lawsuit over the uranium land rush in Montrose and San Miguel counties of Colorado last July has been filed in Montrose District Court. *North Continent Mining Company* is suing to establish title to several mining claims in the Long Park area which were variously staked by *North Continent Union Carbide Nuclear Company*, *Vanadium Corporation of America*, *Greasy Sack Mining and Milling Company*, and several individuals.

Union Carbide Nuclear Company, a division of *Union Carbide Corporation*, has purchased the 160-acre site of the former North Continent vanadium mill at Slick Rock, Colorado for $16,100. Included in the sale by the General Services Administration were five houses, some shop buildings, a light and electric system, and a water system. The property lies on the road between the new Union Carbide uranium upgrading mill and producing mines on the east side of the Dolores River.

Leadville Lead and Uranium Corporation is making steady progress at its property in the Horseshoe area of the Mosquito Range, 20 miles east of Leadville, Colorado. Since late 1952 when the company undertook a DMEA exploration program at its *Dauntless Tunnel*, the firm has been busy consolidating its properties, drifting and raising, making connections to the old workings from the Dauntless Tunnel level, and advancing the underground work toward the Sherman Fault crossing Four-Mile Creek and the south shoulder of Mount Sherman. The mine is now well equipped, the road is kept open winter and summer by the company in conjunction with the county, and this activity is bringing results. A replacement ore body along a prominent fault fissure has been opened up over a thousand feet from any known production. The ore varies from 8 to 30 feet in width and has been opened for a length of 100 feet and an average height to 40 feet in the Leadville Blue Limestone. 600 tons of ore averaging 25 percent lead and 12 ounces silver per ton have been shipped to ASARCO's Leadville smelter and about 30 tons of ore are being shipped daily. Lower grade ore is being left in the mine for the present. The newly found ore body is on the east side of the Mosquito Range and opens up a lot of possibilities along the Sherman Fault. The region adjacent to the fault is highly fissured and fractured because of thrust faulting. The firm had

Marcy-Shenandoah Corporation, with headquarters in Durango, Colorado, will develop the 32-20 vein near Silverton under a 20-year lease agreement with *American Smelting and Refining Company*. Plans also call for later development of the Letter G vein. Under the lease agreement, a certain amount of work is to be done each year, but it will not be required until 1960. Marcy may also extend the lease for an additional 10 years if it so desires. No actual work will start on the 32-20 until May, but Marcy-Shenandoah is already mining the *Garry-Owen* property about eight miles away. The company is presently con-

Gunnison Ships First Uranium Concentrate

The Gunnison Mining Company's new $2,500,000 uranium concentrator (pictured above) at Gunnison, Colorado produced its first uranium concentrate on January 29, 1958, culminating eight years of effort in the uranium business on the part of Vance and Dr. Garth Thornburg who started small uranium mining operations in 1950. Construction of the 200-ton-per-day plant was started in May 1957 by Western Knapp Engineering Company of San Francisco, construction contractor. The mill circuit was designed by H. L. Hazen, metallurgical consultant, of Denver, Colorado. For the present, all of the ore being processed in the plant is supplied by the Thornburg mine on the Los Ochos group of claims in Saguache County, Colorado. However, mill construction has stimulated prospecting and exploration within the area and it is probable that other shippers will be able to supply part of the mill feed during the late summer of this year. Superintendent of the new mill is Cole D. Neff; mine superintendent is Les Ross. Associated in Gunnison Mining Cormpany with the Thornburgs are Sid Richardson and Perry Bass, partners, of Fort Worth, Texas, and the Murchison Trusts of Dallas.

been named the *Leadville Lead Corporation* until 1954 when the name was changed to Leadville Lead & Uranium Corporation because of the firm's increasing mining of uranium.

NORTH DAKOTA

International Resources Company is seeking permission from the AEC to erect a uranium mill at Bowman, North Dakota, or in nearby southwestern South Dakota, to process uraniferous lignite. International has already commissioned W. A. Hazen of Denver to design a 600-ton plant.

The *Santa Rita Mining Company* has been organized to operate mines and explore for uranium and other minerals in North Dakota and Montana. Directors are John L. McCormick, Sr., John L. McCormick, Jr., and Philip B. Vogel, all of Fargo, North Dakota, Wayne Carroll, Billings, Montana, and Herman C. Erling, Bismarck, North Dakota.

UTAH

Glen Larsen and associates who are operating the *Iron Blossom No. 1* and *Iron Blossom No. 3* zinc-lead mines in Juab County, Utah under lease from *Tintic Standard Mining Company*, have encountered an encouraging show of ore at the bottom of one of the drifts. Several carloads of ore have been shipped from the new development and plans are being made to sink a shaft to lower levels for further exploration work.

Delhi-Taylor Oil Corporation still has its $20,000,000 potash development project in Grand County, Utah under consideration. Marketing possibilities are still being negotiated, and apparently no final plans will be made until that point is settled. If and when Delhi-Taylor proceeds with the project, a 6,000-ton-per-day beneficiation plant would be built on Bartlett Point to process the potash for agricultural fertilizer use.

Union Carbide Nuclear Company has completed shakedown runs on its new chemical upgrading plant at Green River, Utah. *Catalytic Construction Company* did the work under contract. The plant will serve the general Temple Mountain uranium district. Its input capacity is between 300 and 400 tons daily, D. M. Pembridge is superintendent.

It has been brought to MINING WORLD's attention that an error occurred in reporting that *American Milling Corporation* had received a concentrate purchase contract from the U.S. Atomic Energy Commission in connection with the pilot plant at Monticello, Utah (see January 1958, page 11). No contract has yet been awarded to the company.

Employees at *Mi Vida* uranium mine of *Utex Exploration Company* in Moab, Utah completed a full year without a lost-time accident. An average of 27 men worked 53,633 hours without a disabling injury.

Officials in *Kennecott Copper Corporation's Utah Copper Division* hope to have the new experimental rod mill being installed in the Arthur mill ready to run in the early part of this year. Tests will then continue for about two years on the $250,000 installation. The rod mill will replace the rolls, elevator, and screens on one section during the test. If the test mill is successful, the division will convert the main plant to rod mill operation. The $18,000,000 addition to the Central Power Station at the Magna mill is scheduled for start of construction around April of this year and possible operation in early 1960. The addition will almost double the plant's power output boosting generating capacity from 100,000 to 175,000 kw.

The Uranium Section of the AIME in Moab, Utah will hold its Third Annual Uranium Symposium on May 9, 10, and 11. This meeting is open to the public and will feature technical papers on all phases of the uranium industry.

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ROCKY MOUNTAIN

Management for a land trade involving national forest land in the area of the proposed iron ore mining development at Atlantic City, Wyoming. Columbia-Geneva purchased 2,433 acres of privately owned land in Medicine Bow National Forest in Carbon and Albany counties which it is trading for 2,316 acres of Shoshone National Forest land covering a block approximately three miles by two miles in size, centered by the iron ore deposit. The land transfer also covers a portion of the state highway right-of-way which Columbia-Geneva may move to the south at its own expense.

Valley Dean Corporation of Bountiful, Utah, completed stripping operations on phase three of its mining operation in the East Gas Hills, of Wyoming. Stripping of 200,000 cubic yards of overburden was accomplished by Rissler and McMurray. Einar C. Erickson, mining engineer, started mining ore immediately and estimated that the pit would be 162 feet deep when bottom of the ore body is reached. Valley Dean expects to mine 40,000 tons of ore in maintaining its 3,000-ton shipping quota to the *Western Nuclear Corporation* mill at Jeffrey City.

Fremont Minerals, Inc. plans to construct a sulphuric acid manufacturing plant at Riverton, Wyoming to supply the needs of its own uranium mill on which construction is expected to start within the month. The present *Western Nuclear Corporation* mill at Jeffrey City, the *Lucky MC Uranium* mill in the Gas Hills, and the *Mines Development, Inc.* mill at Edgemont are potential markets for surplus acid.

A pit 1,000 feet long and 135 feet wide is being opened on the *Eureka 2* and *Imperial 1* claims in the west Gas Hills of Wyoming by stripping contractor Leon White for *Washakie Uranium*. The pit will be 70 feet deep before the 18-foot ore body is encountered, and a total of 200,000 cubic yards will be removed in the stripping. The claims were leased to Washakie Uranium by *Tri-States Uranium*. The new mine is located about half-mile north of *Western Nuclear Corporation's Bull Rush* mine.

The first phase of drilling under the DMEA program on the East Gas Hills claims of *P-C Mining Corporation* in Wyoming is 40 percent completed, according to President John Cummings. *Ormsby Drilling Company* has 10 rigs drilling on the property, probing a graben area on the *Thunderbird* claims.

In the fast-developing Shirley Basin uranium area of Wyoming, 150 claims covering six sections have been sold by John Wells of Dubois, Wyoming, and Jack Kaiser of Thermopolis, Wyoming, to *Kerr-McGee Nuclear Corporation*. It is reported that one ore body at a depth of 40 feet has been blocked out on the property, lying just south of the "original discovery" ore body of *Teton Exploration Company*.

Homestake Mining Company is reported to be sinking a 400-foot shaft on the *Black Hills Hauber Ranch* 40 miles north of Moorcroft in Crook County, Wyoming. The company first found uranium on the property in 1953, and undertook a deep drilling program in 1956. The latter resulted in discovery of substantial sub-surface deposits which will now be mined through the new shaft. Ore will be shipped to the *Mines Development* mill at Edgemont, South Dakota.

Alcoa, Surinam Sign Pact On Hydroelectric Project

A final agreement has been signed between the Aluminum Company of America and the government of Surinam for joint development of a multi-million hydroelectric project in Surinam.

The development, known as the Brokopondo project, will include construction of a 160-foot-high dam on the Surinam River, and building of a power house and transmission lines to supply 150,000 kilowatts. According to the agreement, Alcoa will build the facilities and operate them for 75 years. At the end of this time, the hydroelectric works will be turned over to the Surinam government at no cost. In return, the government will be responsible for providing necessary lands, access roads, sanitation, and for removing population and buildings from the area, which is located approximately 80 miles south of Paramaribo.

Alcoa has also agreed to build a 60,000-ton aluminum reduction plant, utilizing local bauxite ore, near Paranam. The plant is to be completed when power is available.

Cost of the entire project, including the reduction plant, is estimated at $150,000,000, and construction time is set at five years. When the project is completed, Surinam is expected to become the fourth largest aluminum producer in the Western hemisphere.

Alcoa has conducted bauxite mining operations in Surinam for the past 42 years through a subsidiary, Surinaamsche Bauxite Maatschappij. The subsidiary's name will now be changed to Surinam Aluminum Company, and this company will direct all Alcoa's activities in Surinam.

Results of International Atom Agency's First Year

The International Atomic Energy Commission has established headquarters in Vienna, Austria with W. Sterling Cole of the United States as the agency's first Director-General. He is a former member of the United States Joint Congressional Committee on Atomic Energy and will serve a four-year term.

The Agency has a $4,000,000 annual budget and promises of support from member nations which have pledged over five tons of uranium-235 and 200 tons of uranium metal. These will serve as fission materials for 20 reactors.

New Company Formed To Explore Southwest Pacific

A new company, Pacific Island Mines, Ltd., has been established in the Territory of Papua to explore and develop mineral resources in the southwest Pacific area. The company's initial operation will be exploration of gold deposits located on Misima Island, approximately 600 miles northeast of Cairns, Queensland.

The island is known to have a large number of mineral deposits, and profitable mining operations were carried out in the past by Misima Block 10 Gold Mining Company, New Misima Gold Mining, Ltd., and later by Cuthberts Misima Gold Mining, Ltd. Total gold production from Misima was approximately 300,000 ounces, mostly from the Uano deposit. However, at that time operators were interested only in gold and silver recovered from the ozidized zone, Pacific will concentrate on the sulphide zone, below ground and water level, which is yet unexplored. The twenty or more known lodes on the island are believed to be the largest yet discovered in Papua or New Guinea.

The first step in the company's exploration program will be drilling and testing of the Umuna deposit. General prospecting and drilling of other gold lodes will follow.

The company is now is the process of acquiring a subsidiary company, Oceanic Minerals Development Pty. Limited, which holds approximately 22 square miles covering the principal mineral deposits on Misima. This area includes 500 acres held under mining lease and 13,500 acres held under a prospecting reserve.

Directors of Pacific Island Mines, Ltd. are G. W. Noe (chairman), N. A. K. Wallis, A. G. Palmer, and R. H. Peacock. A. G. Palmer will also serve as consulting mining engineer. Offices are located at Port Moresby, Papua, and Sydney, Australia.

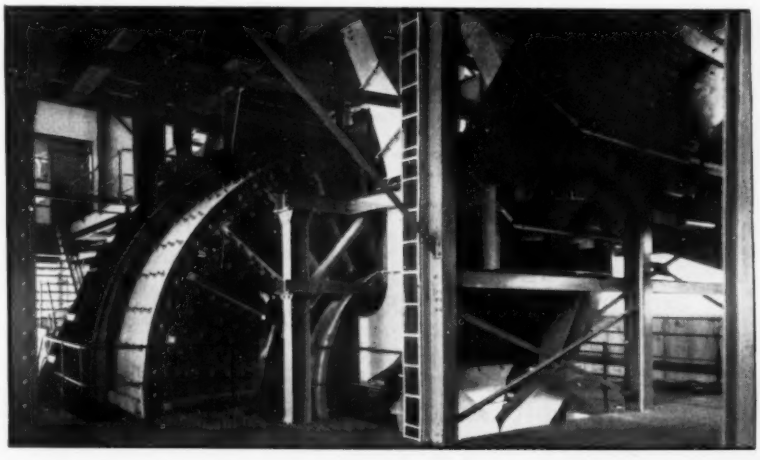
Uranium Fuel May Provide Heat To Process Coal

In the future, nuclear energy may be used to supply heat for the production of coal byproducts and chemicals, according to Jesse Johnson, chief of the Raw Materials Division of the United States Atomic Energy Commission. He indicated that in the next 30 years great progress will be made in the use of uranium fuels for process heat as well as electrical energy.

One pound of uranium has energy equal to more than 1,000 tons of coal, Mr. Johnson pointed out, and by 1960 atomic power stations will use only approximately one percent of the energy potential in nuclear fuels. On the basis of this one percent utilization, 25,000,000 tons of uranium equal about 675,000,000 tons of coal. It now appears that atomic fuel reserves are almost equal to our total reserves of fossil fuels.

Electric energy from atomic power for the initial plants is about 11 to 14 mils per kilowatt-hour. This is only slightly more than electric energy now produced in Europe from imported fuels, which explains why Great Britain and Euratom are concentrating on nuclear work so as to place less dependence on normal fuels.

Estimated uranium reserves in the United States are now about 200,000 tons, with an average cost of about $10 per pound. (See MINING WORLD, December 1957, page 75). There is room for considerable cost reduction in atomic power through less instrumentation, use of cheaper materials, improved metal fabricating of fuel, continuous discharge and charge, and improved engineering. And, according to Mr. Johnson, there is a future for the development of more uranium ore reserves.



Mangula Starts Southern Rhodesian Copper Mill

M. T. D. Mangula Ltd. has brought its underground Molly copper mine and 1,500-ton-per-day mill into operation 18 months ahead of schedule. The firm holds prospecting rights over 99 square miles, including 103 base metal claims, in the Lomagundi district of Southern Rhodesia, 40 miles from Sinoia. M. T. D. is the second Southern Rhodesia copper producer and is an associate company of Messina Transvaal Development Company Limited which operates copper mines in the Union of South Africa as well. Plans are already under discussion to double the mill capacity which will include installation of a second 22-foot-diameter Aerofall mill similar to that shown above. Development work has been satisfactory and work from two shafts, 1,500 feet apart, has produced more than 25,000,000 tons of sulphide ore. Concentrates are being shipped overseas for smelting initially, but plans are proceeding for the eventual erection of a smelter near the mine. Mill throughput has been increased from 1,350 tons per day as the percentage of coarser stoped ore to mill feed increases. Mangula ore is hard so it has been found necessary to add a 2.5 percent steel ball charge to mill feed. All crushing will be done underground with the jaw crusher set at 12 inches for mill feed. Regulation of mill feed is by sound monitor. Moisture content of feed is a critical factor and oil burning jets on intake feed are installed to accurately control feed. The control room shown at top left is completely equipped to monitor and control the entire operation. Even the bearing temperatures are recorded.

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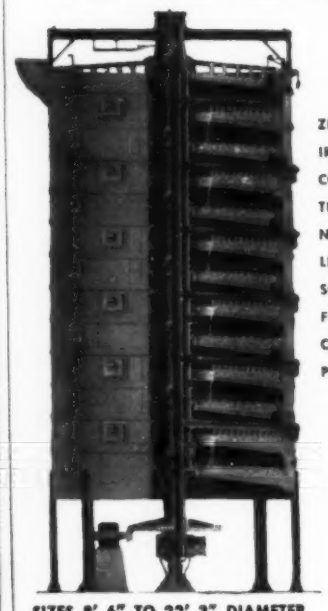

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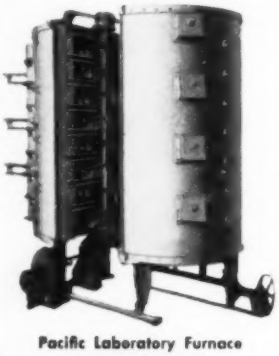

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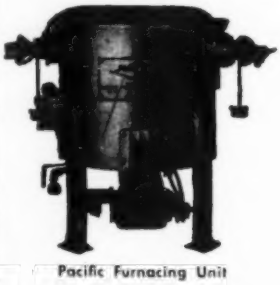

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MALAYA—*Perak Iron Mining Company Ltd.* is developing a new open-pit iron ore mine about five miles south of Ipoh at an estimated cost of $1,500,000. The company expects to produce 200,000 tons during the first year of operation, with a subsequent increase in the following years to 500,000 tons annually. Work has also started on construction of a road from the mine site to Damar Laut, 65 miles away at the mouth of the Dindings River. Harbor facilities will be installed so that oceangoing carriers can load the ore directly for transportation to Japan. Included in the port facilities is the erection of a 1,300-foot jetty which will be able to accommodate 8,000- to 9,000-ton ships. A Japanese firm is providing the technical assistance on the project.

CHINA—According to the Geological Bureau of the State Planning Committee, China's mineral wealth is estimated at 1,000,000 tons of potential coal reserves, and 12,000,000,000 tons of iron ore. Prospecting during the first five-year plan has also established that China has, so it is claimed, the world's richest potential reserves of tungsten, molybdenum, tin, and antimony. The bureau report also states that there are abundant reserves of manganese, copper, lead, zinc, aluminum, sulphur, and phosphorus. The known reserves of the newly located iron ore deposits in northwest and southwest China warrant construction of two new iron and steel plants, each with an annual capacity of 1,500,000 tons of pig iron. The discovery of large coal fields in east, central south, and northwest China will also help to establish new heavy industry in those areas.

KOREA—According to the Ministry of Commerce & Industry, the 1958 operating program for the Changhang refinery (*Samsong Mining Company*) is as follows: 1,500 tons of gold and silver ores will be purchased to produce 80 kilograms of gold and 980 kilograms of silver; 1,950 tons of copper ore will be purchased to produce 200 tons of refined lead. The refinery has never before produced refined lead. An industrial loan of HW693,000,000 has already been requested for the implementation of the program, according to the Ministry.

TURKEY—Negotiations are reported to be under way between the principal mining companies and the Turkish government for establishment of a better currency base for mineral exports. The dollar rate of the Turkish Pound is expected to be raised from $1 equals 2.82 Turkish pounds, to $1 equals 5.20 Turkish pounds. This would enable Turkey to increase its manganese and chrome ore exports at the present market conditions.

HONG KONG—*Mountain Lead Company* is reported to be planning to carry out a thorough prospecting program on its property in the Lam Tsuen Valley, and then to undertake mining on a large scale. Some local difficulties concerning water pollution in the paddy fields below must first be cleared up.

PAKISTAN—The Geological Survey of Pakistan is currently evaluating a manganese deposit in Lasbela. Drilling equip-

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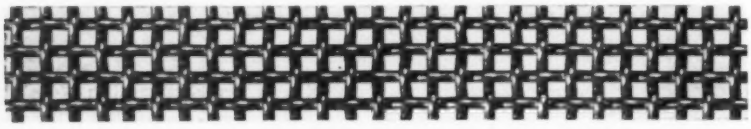

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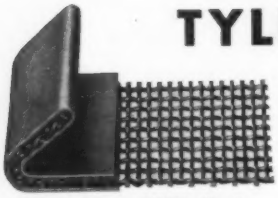

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ment has arrived and prospecting is underway. Work is under the supervision of an ICA advisor. Results are not expected before the middle of the year.

INDIA—A geological survey report has been made of the bauxite deposits in Kalyanpur taluka Halar district, and Saurashtra, Bombay district. The deposits occur in belts of about 30 miles close to the Pindara and Rann creeks. An average analytical test report on samples showed the following (in percents): Al_2O_3 60.94; Fe_2O_3 3.34; TiO_2 2.17; SiO_2 1.46; CaO nil; CO_2 nil; MgO nil; SO_3 0.40; Cl trace; P_2O_5 0.07; combined water 31.88; alkalies 0.10. Prabhudas Vithaldas of Bombay has since applied to the government for the grant of a mining lease. He is also studying plans for a plant which would manufacture alumina, sodium hydrate, etc. to meet the requirements of Indian industries and also to export calcined bauxite overseas.

MALAYA—The *Southern Kinta Consolidated Company* was the first European-owned company to close one of its dredges, the Kampar, because of the International Tin Agreement restriction on tin output. The restrictions were imposed in an effort to maintain tin prices. Reportedly, three other dredges have since closed down.

KOREA—The Ministry of Commerce & Industry has approved an agreement between *Korea Tungsten Mining Company* and *Continental Ore Corporation* (a United States firm) which gives the latter exclusive rights for handling the sale of Korean tungsten for one year. This eliminates during this period the current system of selling tungsten through international auctions.

BURMA—The *Anglo-Burma Tin Company (1956) Ltd.*, a joint venture company, is experimenting with two bulldozers to cut ground for sluicing. Before World War II, the method was to drive a tunnel into the base of the face, and to explode two tons of dynamite. The shattered ground was then washed into sluice boxes with hydraulic giants. Present method is to break the ground with bulldozers because the cost of explosives added materially to the mining expenses. The firm has issued production figures for the period from October 1, 1955. They show that the company produced 88 tons of concentrate in the year ended September 1, 1956; 51 tons in the 10 months ended July 1957. In June and July 1957, five and 21 tons were produced, respectively.

INDIA—Large deposits of fluorspar have been found by Dr. S. P. Choudhuri, geologist, and at his recommendation the *Mineral Mining Company (Private) Ltd.* of Bombay has submitted an application to the government for the grant of a prospecting license. The analytical tests were satisfactory. At present India imports this mineral from the United Kingdom and China to meet the requirements of local industry.

OCEANIA

QUEENSLAND—Construction of the mill of *Mary Kathleen Uranium Ltd.* is

ahead of schedule and water is urgently needed in the new 3,000,000,000-gallon dam. On the advice of *Rio Tinto Australia Pty. Ltd.*, the company has chartered an airplane from the *Commonwealth Scientific and Industrial Research Organization* for two months in order to attempt to produce rain over the catchment. CSIRO has been experimenting with rainmaking for some time and has claimed recently that its experiments have appeared to be successful on a number of occasions, especially in recent trials near Sydney, New South Wales.

REPUBLIC OF THE PHILIPPINES—The Itogon mill of *Itogon-Suyoc Mines Inc.* set a postwar production record in December by treating 17,953 tons of ore. Recovery totaled 3,774.656 ounces of gold. In the previous month recovery was 3,208 ounces. *Marsman and Company* are operating managers of the property. The Itogen mill was only recently expanded to 650 tons per day.

SOUTH AUSTRALIA—Iron ore production has started at the new *Iron Baron* property of *The Broken Hill Proprietary Company Ltd.* near Whyalla. Although the deposit and the adjacent *Iron Prince* were developed as far back as 1933 to provide low-manganese ores, early operations were only on a small scale. When production ceased in 1941, only 2,000,000 tons of ore had been produced. In the recently opened project, an expenditure of £A1,300,000 was undertaken, with road regarding and new construction, rebuilding of rail tracks, electrification, and mechanization. Two Marion six-cubic yard shovels will load ore into 30-ton Mack trucks.

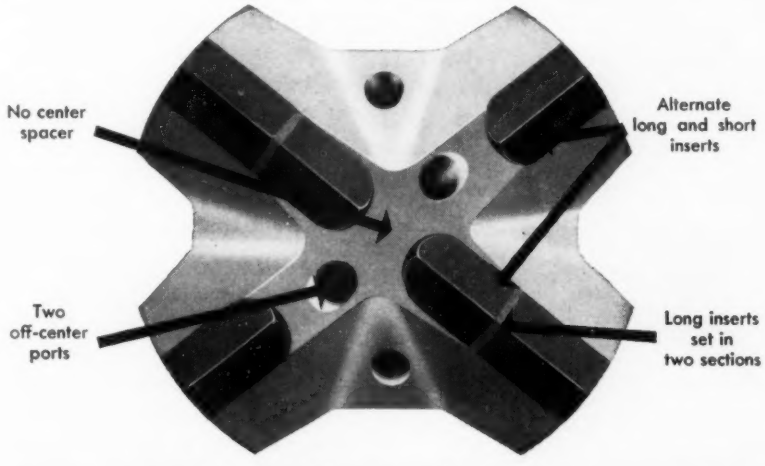
INDONESIA—Production of tin in concentrates dropped about 7.5 percent in 1957, as compared with 1956. This, however, was somewhat better than anticipated. Because of the unsettled political situation in Indonesia, it was estimated that 1957 output would decline by 10 percent. Actual figures were as follows: 1957—27,725 tons; 1956—30,053 tons. It is not known at this writing whether Indonesian tin ores are being shipped to Singapore for smelting, or to The Netherlands as in the past.

NORTHERN TERRITORY—*Aberfoyle Tin N.L.* has purchased all of the shares of *North Australian Uranium Corporation* held by the *Atlas Corporation* in the United States.

TASMANIA—*Montana Silver Lead N.L.* at Zeehan has been offered a contract for an initial shipment of 1,000 tons of nickel-copper concentrate. Two profitable ore bodies have been indicated by prospecting. These are the *Nickel Reward* and *Cuni North*. Eight drill holes put down on a geophysical indication gave 7 to 8 percent nickel and 2 to 5 percent copper values at shallow depth, permitting open cutting for the most part. Active prospecting of the extensive *Serpentine Magna* area is to be continued. The company is calling for further capital to finance a program of road construction and mine preparation. These ore bodies, though apparently small as yet, must be considered interesting.

NORTHERN TERRITORY—The *Maranboy* tinfield could possibly become the largest tin producer in Australia. *United Uranium N.L.*, with a mine at South Alligator River, is prospecting the field with *Loloma Gold Mines N.L.* and *King Island Scheelite N.L.* If successful, the field may produce 500 tons of ore per day, using 600 men. The first shaft is down to 170 feet and at 125 feet has revealed 17 feet of 1.75 percent tin ore. Australia has been importing 500 tons of tin yearly and this is expected to increase to 1,000 tons now that the tin plate mill is functioning at Port Kembla, New South Wales. This addition of 500 tons will occur despite commencement of production by *Ravensthorpe Tin N.L.* in Queensland which is to produce 500 tons per year.

REPUBLIC OF THE PHILIPPINES—*Atlas Consolidated Mining and Development Corporation* increased its output from the Toledo mill in December after a slight setback because of a continuing water shortage. In December the mill treated 365,442 tons of ore assaying 0.69 percent copper for a production of 7,041.5 dry short tons of copper concentrates containing 3,896,373 pounds of copper and 985.8 ounces of gold. Shipments of copper concentrates for the month totalled 5,480 dry short tons containing 3,070,881 pounds copper and 768.2 ounces of gold. 1,250 tons of pyrites were shipped to the *National Power Corporation's* plant at Iligan and one shipment of 9,200 metric tons of iron ore was made from the *Mati* iron mine of Atlas. Also in December, *Lepanto* produced 4,085 tons of concentrates from 36,510 tons of ore treated. The concentrates contained an estimated 2,240,630 pounds of copper and 3,814 ounces of gold. The ore averaged 3.22 percent Cu and 0.130 ounces Au per ton.



Only KENNAMETAL* PX Rock Bits

have these four exclusive features to give you faster penetration . . . longer service life

Each of these Kennametal features can mean savings to you:

- End milling the bit body to receive the carbide inserts eliminates the need for a center spacer
- Two short inserts permit two water ports to be located off-center where they will not clog.
- Setting the long inserts in two sections makes them stronger and lengthens bit life.
- "X" design eliminates rifling and speeds penetration by providing space for fast clearance of large chips.

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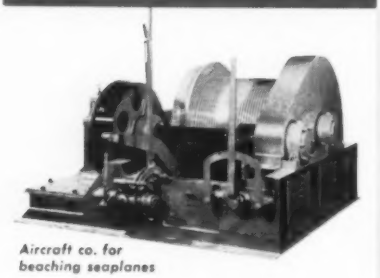
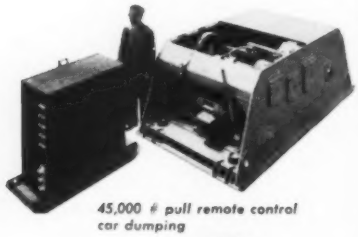
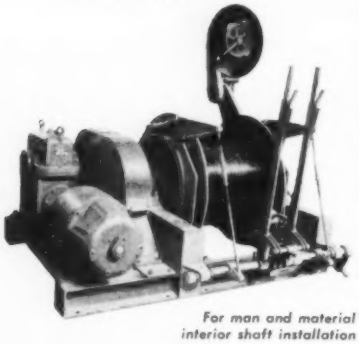


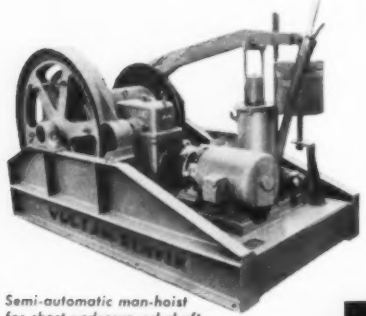
Aircraft co. for beaching seaplanes



45,000 # pull remote control car dumping



For man and material interior shaft installation



Semi-automatic man-hoist for short underground shaft— no cagers or hoistmen necessary.

These slow-speed hoists have many jobs: . . . driving long raises, car spotting, underground hoisting, short distance and semi-automatic skip operating, car dumping, smelter furnace charging, pump equipment hoisting, docking sea planes and others.

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Let our engineers show you how a Vulcan design can solve your hoisting or winching problems, quickly, efficiently and economically.

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INTERNATIONAL

QUEENSLAND—The State Government has approved a draft project for £50,000,000 with the *British Australian Consolidated Zinc* (COMALCO) group to treat Cape York bauxite. The agreement required special legislation to give an initial mining franchise over 2,000 square miles. Under previous conditions, a franchise could only be given for 320 acres. Cost of a smelter to produce 200,000 tons of aluminum annually is estimated at £A130,000,000, including £A35,000,000 for power generation. It has been stated recently that export of alumina will start within two years; it is more likely that bauxite exports would start within that time.

REPUBLIC OF THE PHILIPPINES—The Philippines' largest refractory chromite producer, *Consolidated Mines Inc.*, shipped a total of 611,266 tons of refractory chrome ore in 1957, as compared with 581,685 metric tons in 1956. The United States imported most of this since the U. S. buys more than 85 percent of its refractory chrome requirements from the Philippines. Other buyers included the United Kingdom, Canada, Japan, and Australia.

REPUBLIC OF THE PHILIPPINES—*Dawahan Mining Company Inc.* has been organized to mine and process gold and other minerals. Incorporators include Emerito Ramos, Emerito Ramos Jr., Horacio de la Rama, Rodolfo Ledesma Jr., Filomena R. Ledesma, Rafael O. Jose, Dominador Bernardo, Manuel M. Ramos, Felicito R. Calimlim, and Alfredo R. de la Merced. This same group recently formed two other companies: *Philippine Industrial Explosives Company* and *Pan Asian and Iron Mills*. Emerito Ramos is majority stockholder.

NEW ZEALAND—The tempo of interest in New Zealand's black sands appears to be quickening because of the vanadium, thorium, and titanium content. Though reports are vague, one of the largest United States steel companies is said to have made overtures to the government, while three large British and Continental iron and steel companies are showing an interest in the company recently formed to develop these iron sand deposits.

SOUTH AUSTRALIA—Proposals are being considered for the expansion of the Mines Department's research and development laboratory to provide for the mining industry of Australasia. The State Government is prepared to share the laboratory facilities provided that the needs of its own mining industries do not suffer. The Mines Department lab has, in recent years, earned an enviable reputation for itself in connection with a number of mining and metallurgical problems, especially those concerned with some of the scarcer minerals and uranium in complex ores.

NEW GUINEA—*Bulolo Gold Dredging Ltd.'s* No. 5 dredge is the only one now operating. Its recent recovery results have been higher than estimated but it is expected that the dredge will have to cover some low-grade ground in order to reach reserves formerly allocated to dredge No. 7 and this will lower recovery averages. Joint prospecting for minerals in New Guinea with *Placer Development Ltd.* has been continuing. Possible nickel potentialities were being considered but so far the grade of nickel has not been commercial.

FEDERATION OF RHODESIA & NYASALAND—High quality emeralds have been found in Southern Rhodesia in the Belingwe Native Reserve (usually identified with the large *Turner and Newall* chrysotile asbestos mine at Shabani), some 130 miles west of Bulawayo. The government is reported to have reserved the area and restricted sale of these gems to avoid a rush into the district.

UNION OF SOUTH AFRICA—*President Steyn Gold Mining Company* has completed and commissioned a waste sorting and reef picking section in its reduction plant, thereby increasing effective capacity of the plant. The gold and uranium grade of the mill feed has also been improved, and the treatment capacities of the firm's joint uranium plants, one on its own property and the other at *Welkom*, correspondingly increased. In due course, the sorting rate will be advanced to 10 percent of the reduction plant feed, which may be increased to about 110,000 tons a month this year, from the current rate of a little more than 90,000 tons. The company is also planning to sink a joint twin shaft system in the southwestern section of the lease area where the ventilation facilities of the No. 2 shaft are too remote and inadequate to permit development of the area. The twin system would be sunk in conjunction with *President Brand Gold Mining Company*. In the northern No. 1 shaft workings, additional ventilation capacity will become available when, in the near future, these have been connected with the joint ventilation shaft already completed in the neighboring Welkom lease area.

EGYPT—The management of *Sinai Mining Company* has reached an agreement with the Egyptian government relating to the sale of the company's entire undertaking in Egypt for £500,000. Payment will be made out of the net proceeds of the export of manganese ore. The company will receive 100 percent of the proceeds until £100,000 has been paid, 20 percent until a further £100,000, and 10 percent until the balance of £300,000 has been paid. The mining properties are located at Umbogma in the Sinai Peninsula. A railway and aerial tram connect the mines at Umbogma with the port of Abu Zenima. A 200,000-ton-per-year plant has been erected.

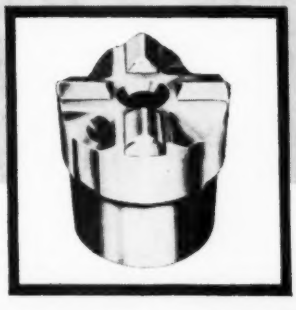
TANGANYIKA—With the recent death of Dr. J. T. Williamson, the future of the *Mwadui* diamond mine and *Williamson Ltd.* remains somewhat uncertain. Dr. I. C. Chopra, one of the shareholders, has stated that the mine will continue to operate as before "for the benefit of the employees and the Territory." A. H. Pike, the Tanganyika government member for Lands and Mines is taking part in negotiations. Dr. Williamson discovered the top of the main pipe at Mwadui in 1940, and was granted a 25-year lease from the Tanganyika government. The mine now employs 6,000 workers and produces £3,000,000 of diamonds per year extracted from kimberlite at the rate of 2,000 tons per day. Mr. Williamson joined Sir Ernest Oppenheimer's *Diamond Corporation* in 1947, and his company is allowed a 10 percent participation in sales, limited to £25,000,000. He held a concession in the Musoma area of the *Tanganyika Reef* gold mine, and also bought the *Stanley White* mine at Vduhi, 18 miles from Mwadui. A large new plant was brought into operation in 1955 at a cost of £5,000,000.

UNION OF SOUTH AFRICA—*Welkom Gold Mining Company Ltd.* is deepening its No. 1 shaft another 300 feet, and is preparing to deepen No. 2. This will provide additional development faces and thereby facilitate increased development footages; the lack of sufficient faces has recently held back the development rate, especially in periods of delay when water fissures required cementation. The 18-foot-diameter ventilation component of the joint No. 3 twin shaft system has been completed; the 24-foot-diameter hoisting component should be completed by September. Then the southwestern section will be developed and should contribute a small tonnage to the mill feed by the year end.

BELGIAN CONGO—*Union Minière du Haut Katanga* has announced that it will reduce its 1958 copper output to 90 percent of 1956 production; that is, to about 222,000 metric tons. The cutback is considered necessary because of the persistent weakness in the copper market, and is the company's attempt to co-oper-

A TUNGSTEN CARBIDE INSERT BIT

Used to destruction without resharpening



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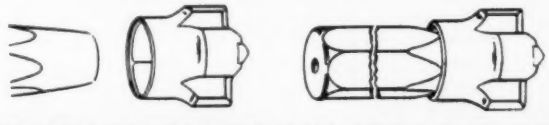
UNIQUE DESIGN — FAST CUTTING ACTION

The Liddicoat Bit was developed as the answer to a long felt need for a tungsten carbide insert bit designed to give fast cutting performance . . . long cutting life . . . low initial cost . . . low cost per foot drilled. A bit that can be used to destruction and then discarded, thus eliminating costly labor and equipment necessary for resharpening. In the design are unique features which cannot be built into the conventional multi-use bit that has to be resharpened.

TAPER SOCKET — NO THREADS — FAST, FIRM ATTACHMENT

The type TS Tee Cee Liddicoat (no resharpening) bit has a completely new taper socket connection. Within the socket of the bit is a brass shim. The socket, which is completely forged, is tapered to correspond to the taper placed on the drill rod. The connection assures an absolute attachment to the rod, and yet permits easy removal.



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PUSH IN

FRESH AIR

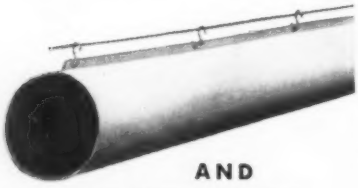
PULL OUT

FOULED AIR

WITH

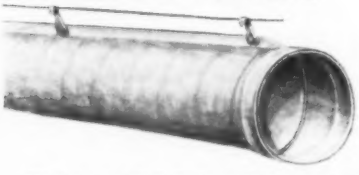
A B C

NEOLON FLEXIBLE VENTILATION TUBING



AND

WIRE REINFORCED NEOLON TUBING



"Push In and Pull Out" ventilation is becoming increasingly popular in mines because of its effectiveness. A B C Tubing of **NEOLON** —the amazing, tough, rip-proof neoprene coated nylon fabric—gives longer service with maximum economy. Regular **NEOLON** Flexible Tubing for blowing in fresh air and Wire Reinforced **NEOLON** Tubing for exhausting fouled air. All standard diameters, in any length. Both types easy to couple and choice of "S" hook or Rivet Hook suspension. A B C Tubing is the most complete line. Send for Catalog 158.

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ate in eliminating the world copper production surplus.

FEDERATION OF RHODESIA & NYASALAND—*Kafue Development Company* is reported to have reached an agreement with *Rio Tinto (Northern Rhodesia) Ltd.* and *British South Africa Company Ltd.* under which Rio is granted exclusive prospecting rights on the Kafue Company's areas in the Federation for a period of three years.

NIGERIA—*Jantar Nigeria Company* is making every effort to mine deep seated alluvial tin deposits known to lie below the sheet of basalt which, until now, had been considered to be the bedrock. Latest reports show that production stage—tough at present on a small scale—has been reached. Results are encouraging but the ultimate success of this venture cannot be assessed at this time.

FEDERATION OF RHODESIA & NYASALAND—The *Broken Hill Company* has closed its new lead smelter because of production cuts which followed the heavy decline in lead prices. A limited production of lead, mainly for local use, will be maintained by the Newman hearth plant.

SOUTH WEST AFRICA—The High Court at Windhoek has dismissed, with costs, an application by the *Consolidated Diamond Mines of South Africa Ltd.* for a declaration of mining rights between the high and low water marks of a coastal strip of South West Africa, about 230 miles long. The case arose out of the granting of mining rights by the South West Africa Administration to *Suidwes Prospekteerders*. There has been no indication that Consolidated Diamonds intended to mine the ground between these high and low water marks in the discernible future so the company protest is apparently based on the fact that granting such rights to another firm will impair security measures. The operations at present are so isolated that a stranger would be quite conspicuous; getting in or out of the area involves a long arduous journey or the use of an airplane whose presence could not be concealed. If another company were to operate on the coast, Consolidated Diamonds would be obliged to provide a right of way. Also, the company itself could encounter considerable difficulties in obtaining sea water for its own use and disposal of tailings.

TANGANYIKA—*New Consolidated Goldfields Ltd.* which manages the *Geita Gold Mining Company's* operations has decided to loan another £100,000 which, the management says, is the last contribution it will make toward bringing the mine to a profitable operating basis. Since 1953, a total of £575,000 has been invested in the mine. New Consolidated now believes that the mine can be brought to a milling rate of 30,000 tons per month by July 1958. To reach this rate, and to maintain it, ore pillars above the No. 6 level must be systematically and rapidly mined, while a new subvertical must be started immediately to be ready to hoist ore from the No. 8 and No. 9 levels not later than April 1960, and from No. 8 to 10 levels not later than July 1961.

UNION OF SOUTH AFRICA—Extensive options over very considerable areas have been unofficially reported as having been taken up in the Eastern Free State, in the Brandfort, Excelsior, Ficksburg, Ladybrand, and Clocolan areas. This fol-

NEW FOR YOUR CONVENIENCE...

FLEXCO

"25-PAK"

TWENTY-FIVE COMPLETE SETS OF FLEXCO HD BELT FASTENERS NOW AVAILABLE IN ONE EASY-TO-HANDLE ECONOMY BULK PACKAGE

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Label on each "25-PAK" box has chart indicating the number of FLEXCO HD Fasteners to use for given belt widths.

Standard shipping carton contains four "25-PAK" boxes of one size fastener. Keep a supply of "25-PAKS" on hand. Easy to store and inventory, sturdy boxes and shipping cartons have many uses.

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Flexible STEEL LACING COMPANY

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FOR THE SPLICE OF A LIFETIME

lows earlier reports that prospecting was in progress for diamond deposits, but the extension of activities suggests that other mineral deposits, especially gold, are considered as likely to be present.

LATIN AMERICA

CHILE—Three new copper smelters are planned for Chile this year to treat the production of small-and medium-scale miners whose needs are not covered by the present smelter at Paipote located in northern Chile. *Caja de Credito Minero* and its subsidiary *Empresa Nacional de Fundiciones* will build one smelter at Ventana de Quintero on the Pacific coast about 140 kilometers from Santiago. This smelter may eventually be expanded to include a unit for making electrolytic copper. This same group will also convert a former cement plant at Juan Soldado for copper smelting, and plans construction of a third unit at Ovalle, midway between Santiago and Paipote. The Paipote smelter treated an average of 11,500 tons of ore per month in 1957, producing an average of 1,300 tons of blister copper monthly.

MEXICO—Mexico's 1958 silver bullion exports began with the shipment from Tampico to the West German government of 440 bars with a total weight of 15 metric tons. This consignment was dispatched by the Bank of Mexico which valued it at more than $560,000.

BRAZIL—*Hanna Coal & Ore Corporation*, a subsidiary of *M. A. Hanna Company* of Cleveland, Ohio, is reported to have received an option from Leo Model of the New York investment firm of Model, Roland & Stone, to acquire with him a substantial interest in *St. John d'el Rey Mining Company*. Mr. Model is the controlling shareholder in the company. St. John has been producing gold in Minas Gerais state for about 126 years. About 2,000,000,000 tons of iron ore reserves have also been estimated to be on this property, along with some bauxite and manganese.

BOLIVIA—The *Bolivian Mining Corporation*, the government's mining agency, has decided to close the *Bolsa Negra* tungsten mine which is said to be uneconomic. The agency has also announced that in the future the *Kani* mine will produce only tin, eliminating tungsten output. Under the International Tin Conference agreement, Bolivia's quota for tin production has been reduced.

CUBA—*Compania Minera Fertrueba* is seeking financial assistance from the *Banco de Desarrollo Economico y Social* (BANDES) to help develop the *Coto Aguas Claras, Nuevo Potosi*, and *Argupada* gold concessions in Holguin, Oriente province. This group had been worked rather extensively in the past. BANDES sent a geological party to investigate the property and results have been promising. The company is now in the process of consolidating the concessions legally.

CHILE—In authorizing a 10 percent reduction in 1958 copper production below the 1956 output, the Chilean Copper Department made the following points: production should be adjusted to the terms of effective demand of all markets in 1958; for this purpose production should be set at 90 percent of 1956 output; recommendation would have to be revised if Chile did not find general collaboration of this measure. Overall Chilean production in 1956 was 452,000 metric tons. Production in 1957 at the three large United States operated mines in Chile was 434,480, compared with 442,420 in 1956.

BRAZIL—A new company has been set up by eight Japanese firms to furnish technical assistance and equipment to the *Companhia Siderurgica de Minas Gerais*. The company is named *Japao-Usiminas*, and will be headed by Yeijiro Toyoda, former president of *Nippon Siderurgy*. Kaname Suzuki will be executive vice president. A new steel plant will be built in Minas Gerais by the Brazilian-Japanese group at a cost of $7,780,000. Among the Japanese firms represented in the new company are *Yawata, Shibaura, Hitachi Ltd.*, and *Mitsubishi*.

CHILE—*Braden Copper Company* has been authorized to bring in $2,800,000 in machinery, equipment, and liquid assets for an extension of the flotation section of the *El Teniente* copper mine. *United Satamin Mining Company Ltd.* has been authorized to import $2,900,000 in machinery and equipment for further development of the *Sagasaca* copper mine.

MEXICO—A group of miners in Culiacan, state of Sinaloa, have formed a company in order to purchase and smelt copper ores from the district. A blast furnace will be installed to produce copper matte which will be exported to Japan. Some Japanese firms are financing the operation in order to obtain the copper matte. General Itube of Culiacan is one of the organizers of the firm. Juan Casas will be in charge of the smelter.

PARAGUAY—A group of German geologists is reported to have discovered a rich gold field in the Misiones province of southern Paraguay. The same group is also reported to have located a material resembling uranium near the Brazilian border, some 200 miles east of Asuncion. Samples are being analyzed.

BRAZIL—Government engineers are reported to have located high-grade iron ore in the south central province of Rio Negro. The *Sierra Grande* deposits, where the ore is located, lie in the Atlantic coastal region. The ore is said to be a mixture of hematite and magnetite.

PUERTO RICO—*W. R. Grace & Company* has formed a subsidiary, *International Metalloids Inc.*, for the production of ultra-high purity elemental silicon. A plant is under construction at Toa Alta, 15 miles west of San Juan. It will go into production early this year, with a planned annual capacity of 20,000 pounds of silicon, using a process owned by Pechiney and licensed to the new firm.

MEXICO—A group of mines in Culiacan, state of Sinaloa, have formed a company which will purchase copper ores in the district and smelt them to copper matte. A blast furnace is being installed. A Japanese firm will finance the operation in order to obtain the matte for shipment to Japan. Juan Casas will be in charge of the smelter.

PERU—*Marcona Mining Company* has passed the 10,000,000-ton mark in shipping high-grade iron ore through the port of San Juan. Production started there in May 1953 and is now operating at a rate of 3,000,000 tons annually. A geophysical section is to be organized to evaluate the best instruments and techniques for use in seeking more ore. Both ground and

Orinoco Opens New Iron Mine in Venezuela

The Orinoco Mining Company recently began regular production from the Altamira-Rondon-Arimagua iron ore concessions near Puerto Ordaz in southeastern Venezuela. Development work on the deposit was begun in 1947. Orinoco also has an important iron mine at Cerro Bolivar, west of the Altamira properties. Pictured above is one of eight Kenworth 48-ton rock and ore movers used for hauling iron ore from the Altamira deposits to the ore loading platform located on the railroad connecting Cerro Bolivar and Puerto Ordaz. Equipment to mine and haul approximately 500,000 metric tons of ore a year is assigned to the Altamira-Rondon and the Altamira-Arimagua production. The Orinoco Mining Company is a subsidiary of the United States Steel Corporation. Francis Thomas is president of the firm.

airborne techniques are under consideration.

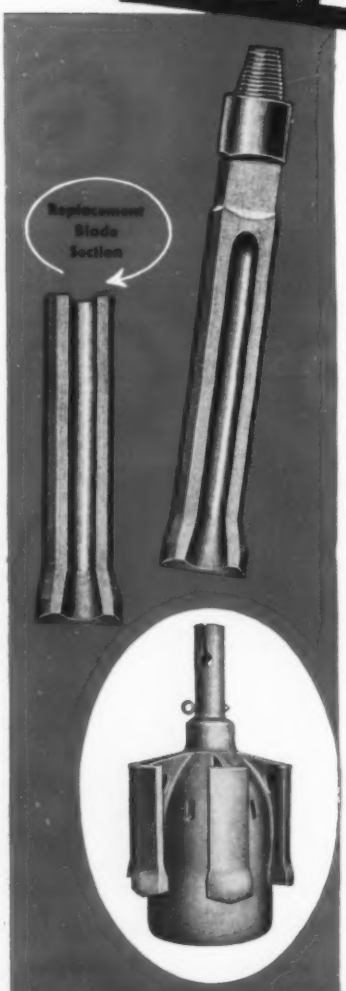
ONTARIO—*Oglebay Norton Company* has signed an agreement wtih *Lun-Echo Gold Mines* for the development of an 81-claim iron ore property at Doran Lake in northwestern Ontario. Oglebay has already started a diamond drilling program. If the property is brought into production, Lun-Echo will receive royalties based upon grade and price. If no production is undertaken within 12 years, a minimum royalty of $25,000 per year will be paid by Oglebay.

NORTHWEST TERRITORIES—*Resource Ventures Corporation* of Salt Lake City, Utah expects to resume operations this spring on its nickel properties in the Northwest Territories of Canada. An airborne and ground magnetometer survey will be carried on first, followed by a drilling program to determine the extent of the presently known ore body. Previous exploration work is reported to have indicated a series of niccolite veins. The program being set up this year is also designed to evaluate the basic intrusive rock as a possible ore source.

SPANG

BLAST HOLE BITS

Drill More Holes Per Bit, At Less Cost Per Hole



SPANG CHURN DRILL BITS, famous for long life and economy in the drilling of blast holes for the fragmentation of minerals or overburden, drill *more-holes-per-bit* at *less-cost-per-hole*, because they are fully heat-treated from end to end and have the *extra strength in pin and blade sections* to stand up under the toughest drilling conditions. They are made with semi-dressed ends for quicker, easier finish-dressing, in High Carbon, A.I.S.I. 4340, and Spang Molloy Steel.

Available also, as an added economy, are SPANG REPLACEMENT BLADE SECTIONS in the same grades of steel, and uniform forge section, for welding to pin and collar sections of original bits when long service has worn the integral blade to a point where replacement is desirable.

Anyway you look at it, SPANG BITS are your best buy for more holes at less cost per hole.

SPANG REAMER TYPE PILOT BITS FOR DRILLING LARGE DIAMETER HOLES

Can be supplied in all sizes and in any practical weight.

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HIGHER STANDARD

SPANG

BRITISH COLUMBIA—*Basic Minerals Ltd.* has been organized at Regina, Saskatchewan to develop the *Bonanza*, *Pathfinder*, *Iron Bell*, and *Bertha* properties north of Grand Forks, B.C. The properties were purchased by *Pan-American Investments Ltd.* of Regina from F. H. Knight of Spokane, Washington.

ALASKA—The *Alaska Nickel Company* is seeking additional financing in order to develop its gold lode properties on Flume and Bonanza Creeks in the Eagle mining district. The company also owns a group of placer claims and two tunnel sites in this area. At the mouth of the Mission Creek and across the Yukon River, the company owns a group of copper, cobalt, and nickel claims. Main efforts now are concentrated on developing the gold properties where a vein has been uncovered. Fred Jenkins is president of the firm.

MANITOBA—*Contact Minerals* will explore its 38-claim rare earth group in the Bird River area during this coming season. Previous work has revealed a large pegmatite dike containing cesium and rubidium mineralization. Surface exploration last season also revealed columbite, tentalite, monazite, beryl, and topaz mineralization.

ONTARIO—Shaft sinking is making good strides at the *Caland Ore Company's* property at Falls Bay. Work was started by *Patrick Harrison & Company* of Noranda in March 1957 and the shaft is now collared. A temporary headframe has also been erected. The 8-compartment opening will be sunk to an initial depth of 1,300 feet. Caland is a subsidiary of *Inland Steel Company*. The property is a part of the Steep Rock basin, and is known as the Steep Rock "C" ore body. First iron ore production will be from an open pit and this is scheduled to start in 1960.

BRITISH COLUMBIA—*Empire Development Company* is debating the reopening of its $5,000,000 iron ore plant at the north end of Vancouver Island. The plant was closed in January just as the operation was starting to show a profit. Severe weather was given as the immediate cause of the suspension but a spokesman said a projected reopening in April will depend upon results of a reappraisal of the situation created by imposition of an iron ore tax by the British Columbian government. The tax was made retroactive and uncertainty existed as to how to calculate the tax.

SASKATCHEWAN—*Mansa Explorations* is undertaking a spring diamond drilling program on its base metal properties in the Wood-Manawan-Uskik Lake area where the firm holds 822 claims in seven groups. Mansa was incorporated in 1956 to take over the properties held jointly by *Midrim Mining Company*, *Nicoba Mines*, and *Taranco Holdings*. Also participating in the organization of Mansa are *Multi-Minerals*, *D'Aragon Mines*, and *Mirado Nickel Mines*.

QUEBEC—*Aluminium Ltd.* has reduced current rate of production from 90 percent of capacity to 80 percent. This amounts to about 60,000 tons annually. The reductions were made at the subsidiary *Aluminum Company of Canada's* Arvida and Shawinigan Falls smelters. Operations at the Kitimat, British Columbia smelter are already below capacity. Last winter the company announced it would defer construction of

new smelting facilities at Kitimat which had been planned for operation in 1958.

BRITISH COLUMBIA—*Bralorne Mines Ltd.* is using a Cryderman shaft mucker in its sinking operations in the Bridge River district. The 34th level station in the Queen shaft has been completed and the shaft is being sunk deeper. Work continues on ventilation raises. The cooling system has been completed.

ONTARIO—*Northspan Uranium Mines'* three new mills should all be in operation by spring. *Lake Nordic's* initial circuit was started up near the end of 1957, *Panel* mine's operations were started up in the early months of this year, and *Spanish American* should be underway soon. The three mills have a combined daily capacity of 9,000 tons. *Rio Tinto Company of Canada* and the Joseph H. Hirshorn interests merged to form Nothspan.

QUEBEC—It is reported that *North Gaspe Mines* plans to reopen the old *Consolidated Candego* lead-zinc-silver mine in Gaspe North under an agreement with *East Macdonald Mines Ltd.* which owns the property. Work is to start as soon as possible, with East Macdonald to receive 30 percent of net profits of any production. North Gaspe will spend $260,000 within two years, and will receive 970,000 shares of East Macdonald. The property is equipped with a 70-ton-per-day mill equipment, machinery, and buildings.

ONTARIO—*Continental Mining Exploration Ltd.* and *Glacier Explorers Ltd.* have agreed to a merger, subject to approval of stockholders. Continental's holdings are mainly comprised on mining interests, while Glacier's chief interests concern oil and natural gas.

ONTARIO—*Montgary Explorations Ltd.* has compiled a report on lithium which is available to anyone who writes to the firm at Suite 1402, 80 Richmond St., West, Toronto, Canada.

LABRADOR—*British Newfoundland Exploration Ltd.* (Brinex), a wholly owned subsidiary of *British Newfoundland Corporation Ltd.*, has been diamond drilling the *Kitts* uranium prospect on the south shore of Kaipokok Bay, 125 air miles northeast of Goose Bay in Labrador, and now indicates the property might support a 200-ton-per-day mining operation. Brinex is now driving an adit approximately 500 feet to intersect the ore zone. From the adit a drift will be driven on the zone to confirm the drilling, and to obtain bulk samples of the ore for metallurgical tests. Total work planned on the adit level is about 1,500 feet, together with additional diamond drilling. The firm conducted prospecting and exploration in the Makkovik-Kaipokok belt for three seasons prior to making the Kitts find.

ALASKA—The *University of Alaska School of Mines* has made available at $2.00 a booklet entitled "Geochemical Prospecting" by Dr. Nalin R. Mukherjee and Leo Mark Anthony. The booklet is the revised edition of one written last year by Prof. Anthony, and includes additional methods and new information. Much of this was gained in the geochemical research laboratory at the school of mines. The authors explained that geochemical prospecting supplements the older methods of searching for ore deposits. The system enables the prospector to seek out invisible signs of mineralization which have gone undetected in the

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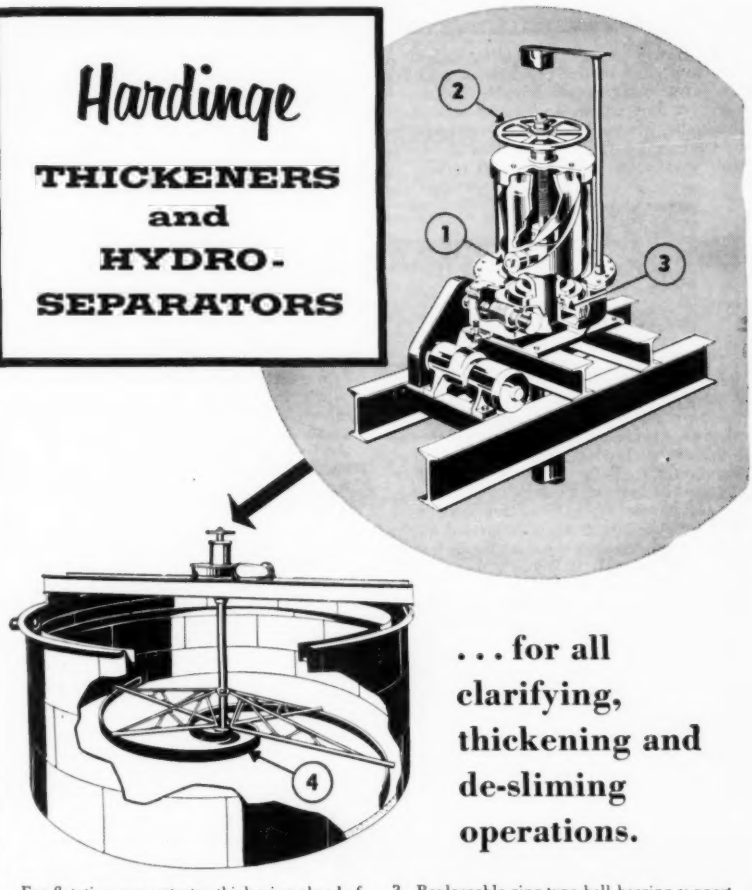

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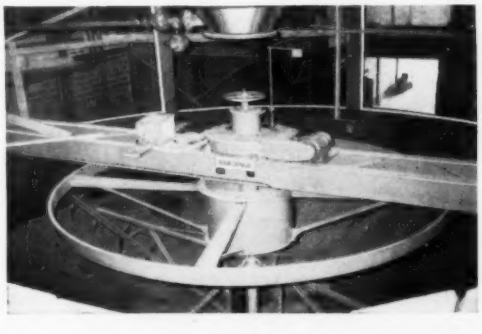

A 35'-diameter Hardinge Superposed Thickener installation in a Canadian lead-zinc concentrator. The sludge outlet for the upper unit can be seen at the top of the picture. Note froth ring on lower unit.

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EUROPE

UNITED KINGDOM—A new exploration program is underway at the *Weardale Lead Company, Ltd.'s Stotsfieldburn* fluorspar mine. Previous development of the mine had reached the 300-foot level when tests indicated that ore could not be treated by gravity methods because of silica. More encouraging results are reported at the company's *Barbary* fluorspar mine, where satisfactory deposits are being worked at the 100-foot level. Additional development of this level is in progress.

ITALY—*Monte Amiate* and *Siele*, Italy's principal quicksilver producers, have formed a joint sales office to market the production of both companies. The sales office, called *Mercurio Italiano*, has been operating since the first of the year. Several years ago, both Spanish and Italian quicksilver producers sold their output through a single organization known as *Mercurio Europeo*, but this was dissolved in 1949.

NORWAY—Extensive layoffs are expected at Norway's largest copper mines, at *Sulitjelma* under the arctic circle, as a result of the recent drop in copper prices on the world market. The Norwegian price has declined from $1,200 per ton in March 1956 to $500 per ton today.

SPAIN—The *Union Espanole de Mines Metalicas* has applied for permission to explore 175 occurrences of lead ore found near Navalonguilla, Province of Avila. A number of silver and lead mines were active in this area in the past.

ITALY—An 8,000-ton limit has been placed on the sale of government-owned copper held by *Azienda Rilievo Alienazione Residuati* in 1958. Sales during the first quarter of the year will be made by secret tender at a rate of 200 tons a month. The amount for sale may increase in the following months, depending on the prevailing market, but it will be held to a maximum of 8,000 tons for the year. Azienda, which is now in liquidation, holds 38,860 tons of electrolytic copper in wire bars, cathodes and billets, and 11,110 tons of copper-wrought products including wire, bars, cables, and drawn wires.

RUSSIA—Following discovery of a tin deposit in the Lake Khanka area, a tin mine and milling plant have been constructed in the area. Production began in January, when 1,000 tons of tin ore were delivered to the mill.

UNITED KINGDOM—Because of the low prices of imported Russian unwrought aluminum, the *Aluminum Company of Canada*, principal supplier of aluminum to U. K., has requested the United Kingdom Board of Trade to impose an anti-dumping duty on all imports of Russian aluminum.

PORTUGAL—A decline in tungsten prices has forced Portuguese producers to seek official assistance in order to remain in business. Although the market price has been declining for months, tungsten production for the first half of 1957 continued at nearly the same level as in 1956, 2,417 tons compared to 2,606 tons. Producers who believe that production cannot be stopped entirely because of the high cost of reopening a mine are now working the higher grade sections in the mines to cut average costs, but feel that this leads to increased costs of development in the future. Estimated cost of present production is 40 escudos a kilo, which is more than the market price. Producers are hoping for government subsidies but no official action has been taken at this time.

EIRE—*Silvermines Lead & Zinc Company, Ltd.* of Shallee, County Tipperary, is negotiating an agreement with *Cyprus Mines Corporation* of Los Angeles, California for exploration of a 30-square-mile area at Menagh, County Tipperary. According to terms of the agreement, Cyprus will finance a three-year exploration program on Silvermines' property. Silvermines will retain control of lead and barite operations near Shallee.

ENGLAND—A. Strauss & Company, Ltd. of London recently released a report concerning future prospects for the tin market. According to this report, approximately 12,000 tons of tin will be exported from Russia during 1958, and the

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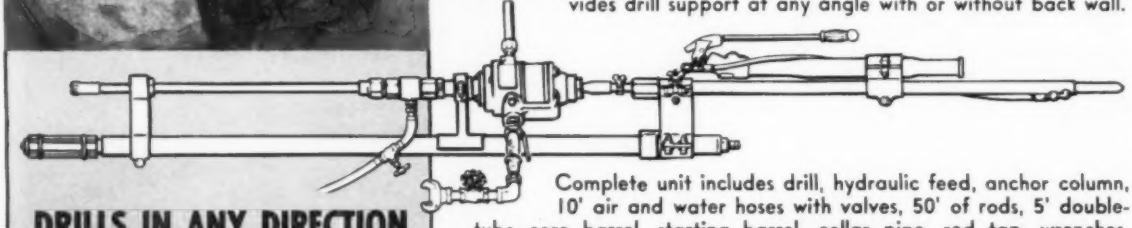

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total world supply for the year will amount to approximately 131,000 tons.

WEST GERMANY—Steel production reached an all-time high in 1957, according to West German officials. The industry's total 1957 output of crude steel is estimated at 25,000,000 tons, which is twice the production in 1950.

WEST GERMANY—Lead and zinc ore producers have requested government aid in the form of a long-term credit plan, to overcome present price difficulties and prevent further cuts in production. The credit plan, which has not yet been approved, would provide that money be made available by the *Reconstruction Loan Corporation* at Frankfurt. Size and terms of credit have not yet been fixed, and it is possible that some other kind of financial assistance may be arranged. The *Gewerkschaft Mechernich Werke Lead Mines* have already been closed because of the present price slump, and *Aktiengesselschaft des Althenberges* will reduce its annual production nearly 50 percent. The *Gewerkschaft August Viktoria* also plans to cut lead and zinc production from 1,000 tons a day to 350 tons, and the *Sachtleben A. G.*, which produced zinc as a by-product of its pyrite production, has halted zinc production, which has been about 5,000 tons a year.

RUSSIA—Discovery of what is believed to be the first bauxite deposit located in the Ukraine has been reported by Soviet geologists. The deposits, found in a 20 kilometer area at a depth of 60 to 70 meters, are located in the Dniepropetrovsk region. It is estimated that the deposits contain sufficient reserves to supply the *Zaporozhye* aluminum reduction plant for the next 40 years.

EIRE—*Irish Minerals, Ltd.* of Arklow, County Wicklow, is considering reopening lead and zinc mines at Keeldrum, County Donegal. The mines have not been worked for over a century.

ITALY—A nuclear power station, producing 150,000 gross electrical kilowatts (500,000 thermal kilowatts) is planned by *SIMEA*, a subsidiary of *AGIP Nucleare*, Italy's state-controlled energy holding company, near Rome, Italy. The station, to be constructed at the mouth of the Astura River on the Tyrrhenian Sea, will be powered by a pressurized water reactor. The *Vitro Engineering Company*, subsidiary of the *Vitro Company of America*, has been awarded a contract for design, engineering, and construction of the power station.

NORWAY—A new method of producing fireproof dolomite has been developed by Professor Haakon Flood of the Norwegian Technological University at Trondheim. The process consists of fusing burned dolomite and olivine in an electric arc. Test results indicate that the processed material has better fire-proofing qualities than any known imported product.

SPAIN—In a recent agreement with Poland, Spain agreed to ship manufactured goods and iron ore to that country in exchange for coal. A Polish commission, headed by J. Kiecz and representing *Zentroap* of Cattowice, Poland, has been inspecting mines in Spain and making tentative ore agreements. The southern Spanish mining company, *Ferrounion*, has reportedly signed a contract with Zentrozap to supply 80,000 tons of iron for the price of $10.50 per ton f.o.b. Aguilas or other Mediterranean ports.

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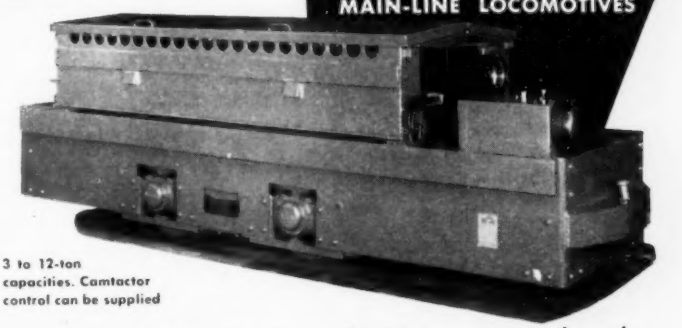

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INTERNATIONAL

HUNGARY—An investment credit of 300,000,000 rubles (about $75,000,000) has been granted Hungary by the Soviet Union. Part of this credit will be used in the first stage construction of Hungary's iron and steel works at Stalinvaros. Russia has agreed to deliver machines and equipment as requested by Hungary between 1958 and 1965. Soviet aid will also be used to develop and reconstruct a number of existing factories producing telecommunications equipment, tools and instruments, Diesel engines, and other products.

NORWAY—The *King's Bay Coal Company* at Spitsbergen has recommenced production, following reopening of the coal mines. Operations had been shut down for several years because the mine was considered unsafe. A new electric power station, which will produce 1,500 kilowatts, has been constructed as well as new houses, canteens, and other utility buildings. In 1958 and 1959 production is anticipated at 200,000 tons annually.

AUSTRIA—A new method of producing steel from pig iron containing 0.5 to 1.5 percent phosphorus has been developed by *Vereinigte Osterreichische Eisen- und Stahlwerke* (Voest), Linz. This process, called oxygen jet converting, is carried out in two stages with different types of slag. In the first stage, slag obtained in the second stage of a previous melt is added to limestone and other material, and the phosphorous content is reduced to less than 0.5 percent with a carbon content of over 1.5 percent. The second stage is a normal, but shortened, jet oxidation of the melt. The resulting steel is of the same quality as ordinary oxygen steel.

SARDINIA—The government of Sardinia recently passed legislation allowing mining research permits to be issued in Sardinia. According to this bill, permits can be issued on areas which are already covered by other permits if the exploration is for minerals not previously covered.

RUSSIA—The use of a pressurized water jet as a mining drill implement is being studied by the *Moscow Institute of High-Pressure Physics*. In recent tests a two-millimeter-thick steel plate was pierced by a water jet having a pressure of 1,300 pounds per square inch. Further testing of this principle is planned.

GERMANY—According to a recent report released by *Metallgesellschaft Aktiengesellschaft* of Frankfurt, the average consumption of non-ferrous metals in the Western World has increased 3.1 percent during the last 10 years. Over the same period the population has increased by 1.2 percent, or 20,000,000 people per year. According to the survey, a further comparatively rapid increase in population is to be expected and great efforts are being made to raise the level of industrial production in countries that are capable of further development. Therefore, it is anticipated that the demand for metals will increase even more in the future.

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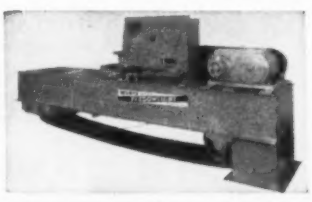

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February 17, 1958

COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	25.00¢
	Lake. Delivered, destinations, U.S.A.	25.00¢
	Foreign Copper, Valley basis	25.00¢
	Custom	24.50¢
LEAD:	**Common Grade.** New York	13.00¢
	Tri-State Concentrate, 80% lead	$156.12
ZINC:	**Prime Western:** F.o.b. E. St. Louis	10.00¢
	Prime Western: Delivered, New York	10.50¢
	Tri-State Concentrate, 60% zinc, per ton	$56.00
ALUMINUM:	**Primary 30 Pound Ingots (99% plus).** F.o.b. shipping points	28.10¢
ANTIMONY:	**Lone Star Brand. F.o.b. Laredo, in bulk**	29.50¢
BISMUTH:	(In ton lots) price per pound	$1.55
CADMIUM:	**Sticks and bars.** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97.99%,** keg of 550 pounds (Price per pound)	$2.00
COLUMBIUM:	**Powder** Nom., per pound	$120.00
GERMANIUM:	**Germanium:** dioxide, high purity, gram	24.00¢-30.00¢
LITHIUM:	**98%** (per pound)	$11.00-$14.00
	Carbonate	82.00¢
MAGNESIUM:	**Ingots (98.8%)** F.o.b. Valasco, Texas, per pound	36.00¢
MERCURY:	**Flasks.** Small lots, New York	$220.00-$225.00
NICKEL:	**"F" Ingots (5 pounds).** F.o.b. refinery, Port Calbourne, Ontario	75.50¢
PLUTONIUM:	To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	$30.00
SELENIUM:	**99.5%,** per pound	$7.50
THORIUM:	per kilogram	$43.00
TIN:	**Grade A Brands.** New York (Price per pound) Prompt delivery	93.125¢
TITANIUM:	**99.3%** + Grade "A" Sponge (Price per pound)	$1.65-$2.50
URANIUM:	**Nominal,** per kilogram	$40.00
U-235:	**Nominal,** per pound	$7,725
GOLD:	**United States Treasury Price**	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	89½¢
	Foreign Handy Harmon	90.375¢
PLATINUM:	**Per Ounce**	$72.00-$75.00
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CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian[1]). 48% Cr_2O_3. 3 to 1 Ratio	$46.00-$47.00
	African (Transvaal). 48% Cr_2O_3. No Ratio	$36.00-$37.00
	Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio Nominal	$53.00
	U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade are and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.	
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12) Per Pound Pentoxide	$1.15
	Per Pound Pentoxide.	$1.15-1.35
IRON ORE:	**Lake Superior. Per gross ton Lower Lake Ports**	
	Mesabi, Non Bessemer, 51.5% Fe.	$11.45
	Mesabi, Bessemer, 51.5% Fe.	$11.60
	Old Range Non Bessemer	$11.70
	Old Range Bessemer.	$11.85
	Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit	26.00¢
MANGANESE ORE:	**Metallurgical grade.** 48 to 50% Mn. Long ton unit	$1.35-$1.40
	Metallurgical grade. 46 to 48% Mn. Long ton unit	$1.30-$1.35
	Metallurgical grade. 44 to 46% Mn. Long ton unit	$1.25-$1.30
	Domestic U. S. Government ore purchasing depots: Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore Phillipsburg, Montana; base price of $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.	
MOLYBDENUM CONCENTRATE:	**90% MoS_2 F.o.b.** Climax, Colorado. Per pounds of contained molybdenum, plus cost of containers	$1.18
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit	$14.00
	Foreign. 65% WO_3 Per short ton unit (Scheelite) Nominal	$15.00
	Foreign. South American, Spanish, Portuguese Nominal	$13.50
URANIUM ORE:	**Carnotite-Roscoelite.** F.o.b. purchase depot or company mill plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, Moab, Green River, Mexican Hat, and Monticello, Utah. Shiprock, and Grants, New Mexico, Edgemont, S. Dakota, Jeffrey City, Wyoming, Tuba City, Arizona. Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ore purchases. Special lime schedule applies at Monticello, Moab and Grants. No lime penalty with no vanadium payment or lime penalty with vanadium payment.	
VANADIUM ORE:	**Carnotite-Roscoelite.** V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots, but excess not paid for at Marysvale, Monticello, and Bluewater. Shiprock has no limit on V_2O_5 to U_3O_8 ratio and all contained V_2O_5 is paid for Per Pound V_2O_5	$0.31

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	Oil Well grade. Packed in 100 pound paper bags	$14.00
	Boron, Technical grade F.o.b. Boron, California Per ton	$47.50
FLUORSPAR:	**Metallurgical grade.** 72.5% effective CaF_2 content per short ton F.ob. Illinois-Kentucky mines	$36.00-$38.00
	Mexican. 70% F.o.b. border	$26.00-$27.00
	Acid Grade. 97% CaF_2, Bulk, F.o.b. Kentucky, Illinois, Colorado	$48.00-$52.00
	Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.	
PERLITE:	**Crude:** F.o.b. mine per short ton	$3.00 to $5.00
	Plaster grades. Crushed and sized. F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$23.50
	Export	$24.00-$26.00

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February 17, 1958

		Per Long Ton		USA Equivalent cents per pound[1]
COPPER:	**Electrolytic spot**	£160	10s Od	20.06¢
LEAD:	**Refined 99%**	£ 73	12s 6d	9.20¢
ZINC:	**Virgin, 98%**	£ 63	15s Od	7.97¢
ALUMINUM:	**Ingot, 95.5%**	£197	0s Od	24.625¢
ANTIMONY:	**Regulus, 99.6%**	£197	10s Od	24.69¢
TIN:	**Standard, 99.75%**	£730	0s Od	91.25¢
TUNGSTEN:	**Long ton unit**	97s		$12.88
		With Sterling pound at $2.80		

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3B	36"	1400#
3B	42"	1540#
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1 Marcy "77"
1 Marcy "66"
1 Eimco "55"

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1 48" X 18' Dorr Duplex Rake
1 60" X 26' Dorr Duplex Rake
1 96" X 25' Dorr Duplex Rake

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1 2-Cell Fagergren 56" X 56"
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1 2400 cfm I.R. PRE-2 435 H.P.
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1 864 cfm Chicago Pneumatic 160 H.P.

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1 Joy HL-3, 18" Gauge

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1 Mancha Electric Mule, 18" Gauge
2 General Electric LSBE-204-B14, 30" Gauge

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1 Size 5 Allis Chalmers Gates
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1 Sullivan Model F-113
2 Ingersoll Rand Model D6UL
3 Ingersoll Rand Model D6U
2 Gardner Denver Model HK
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14—125 CF Western Side Air Dump, 24" Ga.

LOCOMOTIVES

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3— 6-Ton Jeffrey Battery, 36" Ga.
1— 8-Ton Greensburg Battery, 24" Ga.
3— 8-Ton Atlas Battery, 24" Ga.
1— 3-Ton Brookville Gas, 24/30" Ga.
1— 5-Ton Plymouth Gas/Diesel, 36" Ga.
1— 8-Ton Plymouth Gas/Diesel, 36" Ga.
1— 10-Ton Brookville Diesel, 24/30" Ga.
1—100-Ton American Diesel Electric, Std. Ga.

MUCKERS

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1—GD-9 Gardner-Denver, 18/24" Ga.
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1—7 KW General Electric, 440 V A.C.—125 V D.C.
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1—4 Ton Westinghouse battery locomotive
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1—6 Ton Goodman Trolley locomotive
1—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
2—7 Ton General Electric Battery Locomotives
1—7 Ton Jeffrey Trolley Locomotive
1—7 Ton Atlas Battery Locomotive
2—8 Ton Goodman Battery Locomotives
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
1—13 Ton Jeffrey Trolley Locomotive
1—13 Ton Goodman Trolley Locomotive
1—15 Ton Jeffrey Trolley Locomotive

AIR LOCOMOTIVE

1—1½ Ton Universal "Tramaire" Locomotive

LOADERS

2—GD-9 Gardner-Denver Loaders
2—12-B Eimco Loaders
1—HL 3 Joy Loader
3—21—Eimco Loaders
1—HL 20 Joy Loader

SHUTTLE CARS

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1—Joy model 60 D3P Battery Operated

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1—5 HP Sullivan tugger
2—7½ HP Sullivan tuggers
1—10 HP Sullivan 3 drum slusher
2—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
2—20 HP Ingersoll-Rand size 20NM2C, 2 drum slushers
1—50 HP Sullivan Model CF-211 double drum slusher

AIR TUGGER HOISTS

1—Ingersoll-Rand Model DU
2—Ingersoll-Rand Model D6U
4—Ingersoll-Rand Model IH
1—Sullivan Model E-111
9—Ingersoll-Rand Model EUA
1—Ingersoll-Rand Model 10-H
8—Gardner-Denver Model HK
2—Joy "Turbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
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2—2" Ingersoll-Rand 2 stage motor pumps 150-250, GPM, 325-500 ft. head
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4—2½" Pennsylvania 4 stage pumps 200-250 GPM-325-520 ft. head
1—2½" Pacific 6 stage pump 150-200 GPM, 450-680 ft. head
1—3" Allis-Chalmers 3 stage pump 400 GPM, 250 ft. head
2—3" United 5 stage pumps 110-350 GPM, 550-700 ft. head
3—3" United 6 stage pumps 180-350 GPM, 700-900 ft. head
1—4" Ingersoll-Rand 2 stage pump 1000 GPM, 920 ft. head
1—5" Manistee 8 stage pump 340 GPM, 500 ft. head

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LOCOMOTIVES: Diesel electric. One Davenport 50 ton. One General Electric 80 ton. 1—10 ton Diesel. All standard gauge.

MINE HOISTS: One 7' x 7' single drum, 400 H.P., 1⅛" rope. One 10' dia., 7' face, single drum with center dividing flange, 400 H.P., 1¼" rope. One 5' dia., 5' face, single drum, with center dividing flange, 100 H.P., 1" rope. One 84" dia., 54" face, double drum, 1⅜" rope, 400 H.P. One 10' dia., 10' face, double clutched drums, 1250 H.P., 1⅜" rope. All the above hoists have post brakes, Lilly control, 2200 volts and all are complete.

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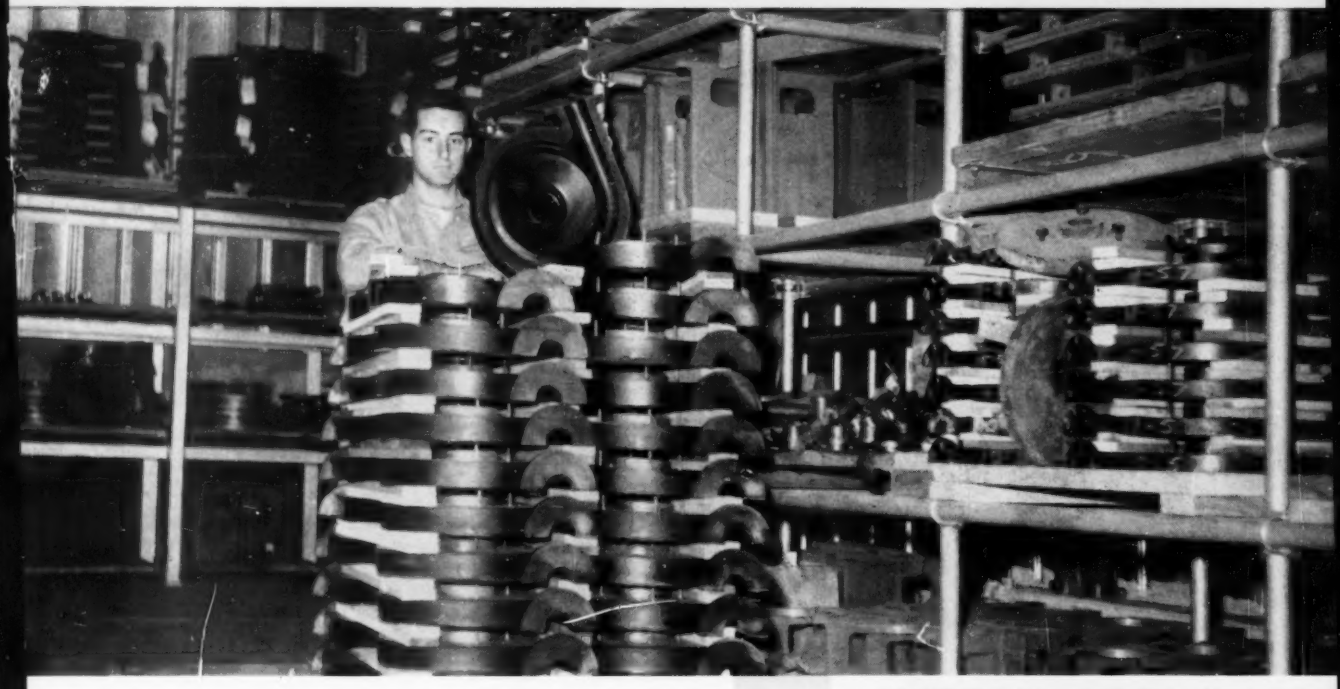

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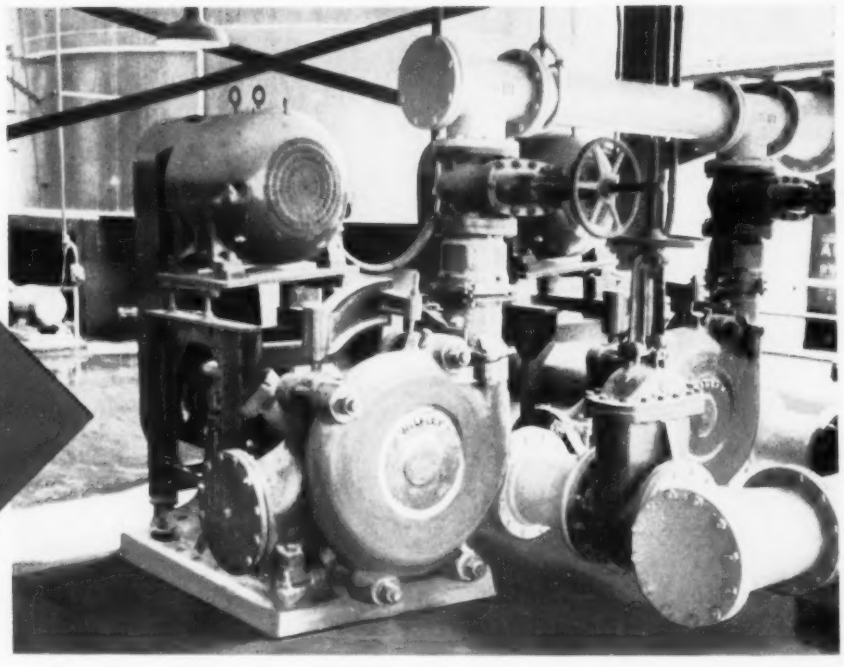

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